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PLANT
INDUSTRY
DIVISION

Annual Report
1989 - 90

Alberta
AGRICULTURE

**PLANT INDUSTRY DIVISION
ANNUAL REPORT**

1989 - 90

91-02338/

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Lab Technician (Fairview)
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Provincial Apiculturist
Apiculturist (Falher)

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Plant Breeder
Research Agronomist
Supervisor, Farm Operations
Research Technician - Winter Wheat
and Triticale
Research Technician - Agronomy
Senior Research Technician
Systems Analyst
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Program
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Word Processing Operator

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Research Agronomist
Technologist, Soil Fertility
Technologist, Soil Fertility
Soils Specialist - Lethbridge
Technologist - Lethbridge

Head, Soil Improvement Section
Specialist, Organic Soil Management
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Potato Technologist	Ms. Annette Bergen
Vegetable Crops Research, Extension	Dr. Paul Ragan
Vegetable Crops Technologist	Mr. Tug Maruno
Vegetable/Potato Agrologist	Ms. Cathy Feth
Fruit Crops Research, Extension	Mr. Lloyd Hausher
Fruit Crops Technologist	Mr. Te-Sen (Peter) Pih

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Field Crops Technologist	Mr. Henry Najda
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Farm Worker	Mr. Randy Hellmer
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HIGHLIGHTS



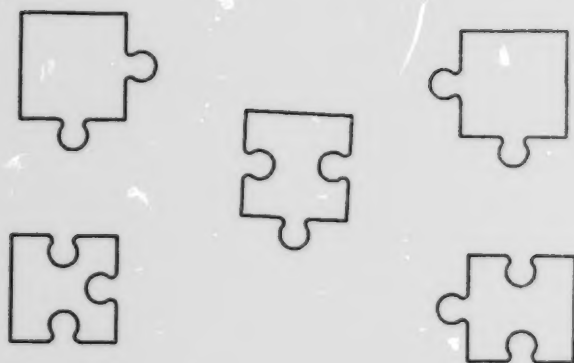
HIGHLIGHTS

- A program assisting farmers with the cost of testing canola seed for virulent blackleg disease operated for the second year. One sample was found to be infected, in comparison to none recorded for last year. Alberta farmers have been successful in maintaining infestation levels below 1% of the seeded acreage of canola.
- Dr. Michi Okuda and Mr. Ken Wright transferred from Fairview to Olds in October. They will join Mr. Steve Slopek and Mr. Mark Anderson in forming the nucleus of a program to test for resistance to insects and plant diseases. The program will determine where resistance occurs in breeding lines and pass this information on to plant breeders for incorporation into commercial varieties.
- Russian wheat aphid failed to develop as a major pest in the summer of 1989. Late spring weather contributed to almost 100% mortality of overwintering aphids. Survivors or new migrants contributed to a build up of aphid populations over summer but by late winter of 1990 their population had again declined.
- Considerable emphasis (including two major seminars) was focused on training producers in methods of reducing livestock predation. The use of electric fencing, guard dogs, toxic collars and better herd management was strongly promoted as an alternative to predator control.
- The "Guide to Crop Protection in Alberta, Part I - Chemical Control", long the most widely demanded departmental publication was printed in record numbers and still remained in short supply; however demand for "Part II - Non-chemical Control" also increased dramatically with 5,000 copies of the second printing being distributed. This may signal a shift in emphasis to a more balanced view of pest control techniques.
- Approval was obtained to implement a farmer training program leading to a certificate in pesticide application. The course will be developed with strong industry support and will be offered via a cooperative program with Olds College.
- The Federal Pesticide Regulatory Review has progressed through some difficult stages with very strong input from Alberta's review team. The latest draft plan is showing promise and the process will soon be opened for public review and comment.
- The Weed Control Act was revised to ease its administration and modernize the penalty provisions.

- The Crop Research Breeding Program, conducted by the Field Crops Branch, was severely hailed out in Alberta. Significant measures had to be taken to recover the losses by sending advanced lines to winter nurseries for selection, only to have a major frost in California that caused 60 - 70% sterility. Over 200 populations were affected.
- A new winter triticale, which has significant benefit for pasture when spring seeded, was granted registration and will be named Pika. This new variety was assigned to SeCan Association who allocated it to the United Grain Growers for marketing. Breeder Seed Production was moved to Oregon.
- A new 2-row hulless barley named Condor was registered and released by the Field Crops Branch. Condor has a significant benefit for hog feeding and the Canadian Wheat Board contracted 10 carloads (900 tonnes) of Condor to explore the market opportunities in the human food market.
- The Oat Producers Association of Alberta was formed and will provide a better focus and opportunity for improving the breeding, marketing and processing of oats in Alberta and into export markets.
- A new municipal co-op seed plant was established at Pincher Creek for \$600,000 and a new replacement plant is under construction at Rycroft - approximate cost of one million dollars.
- Seventy-nine municipal co-operative seed plants processed 33,947,828 bushels of seed in 1989-90 fiscal year averaging 435,000 bushels per plant.
- There were 36 seed plant upgrading grant applications totalling \$419,393 represent the province's 30% participation. This translates into \$1.4 million in upgrading.
- Research, undertaken by the Field Crops Branch to determine the role of winter cereals for pasture where they are underseeded to perennial forages, grazing the winter cereal covercrop and allowing the perennials to establish underneath, was of substantial interest to producers.
- A perennial forage varietal evaluation program (for hay) on 10 sites with planting commenced in 1990.
- An estimated 4,600,000 acres for tame hay production yielding 9.8 million tons which represents 29% of the Canadian total.
- Alberta alfalfa pellet production was 274,000 tons - a 50% increase over 1988. Alberta cube production represents 90% of Canadian production.

- Densified hay production this year was 9,800 tons. Staff were heavily involved in relaying information, relating to crop types, agronomy and the species best suited for densified bales for export. Staff were also involved in establishing the protocol for sanitary and insect pest regulations for export forage.
- Alberta has approximately 20% of the pedigreed seed acreage in Canada with 250,929 acres in 1989 and 1,083 pedigreed seed growers.
- The potential for spring and winter triticales for producing the best mixtures for silage, show encouraging results.
- Construction of the laboratory addition to the Hargrave Building at the Alberta Special Crops and Horticultural Research Center was completed. This addition gives the Center an opportunity to expand its research in the areas of controlled environment storage and in controlled environment plant growth facilities.
- The Alberta Greenhouse Industry Assistance Program provided over \$200,000 to 26 projects. This program provides matching fund assistance to growers for technology improvement and crop diversification.
- The ASCHRC saskatoon harvester was leased to an association of growers, who will provide a custom harvesting service to the industry.
- As part of the Prairie Potato Breeding Program two selections were named; A69868-2 is named "Amisk", and W848 is named "Niska".
- Dr. Claude Monin, Flavor Chemist from France, spent time in Alberta to provide consultative advice on essential oil quality extracted from Alberta grown herbs and spices.
- Dutch Elm Disease monitoring on the Montana border was enhanced with financial assistance from several municipalities including the cities of Calgary, Lethbridge and Medicine Hat.
- Research data from ASCHRC was used to support the registration of five pea and four bean varieties.

BRANCH ACTIVITIES



CROP PROTECTION BRANCH

Summary

The mission and strategies of the Crop Protection Branch remained unchanged in 1989-1990. The mission of the branch is "to protect Alberta's crops and agriculture from losses due to pests, through the development, implementation and adoption of economically justifiable, effective and environmentally sound pest management programs and strategies".

The Branch focuses on two major strategies:

- Keep Alberta free of specific pests by operating programs to exclude and/or eradicate these pests whenever this approach is both possible and practical.
- Reduce the damage done by pests in those instances where eradication or exclusion is impossible or impractical.

Within these broad strategies the Branch operated programs to achieve the following goals:

A. Exclusion

- Rabies control program including maintenance of buffer zones along the Saskatchewan and Montana borders to keep rabid animals from bringing the disease into Alberta.
- Maintain Alberta rat free primarily through a publicity program and operation of a buffer zone along the Saskatchewan border.
- Bacterial ring rot of potato is monitored in all commercial fields and control is integrated with programs of other branches plus the Federal Government. The goal is complete eradication of the disease by 1993.
- The diffuse and spotted knapweed program has reduced the acreage of these weeds below 100 acres and follow up is routinely conducted on scattered patches. Continued maintenance is required to prevent reinfestation from Montana and British Columbia where millions of acres of these weeds exist. Our goal is to complete the eradication of both species.

- Nodding thistle has been all but eradicated from its major infestation area around the City of Calgary. Follow up is conducted to ensure the weed remains in check.
- Blackleg of canola has spread beyond the point where eradication may be practical, however, major effort is being made to contain the disease to the east-central area and to check spread via infested seed. Crop rotation and continued vigilance are being promoted.
- Tracheal mite of honeybee has now spread to at least seven operations and exclusion and/or eradication have ceased to be viable options. Efforts will be directed to improving management practices or finding better control methods.

B. Mitigation

Most crop pests in Alberta consist of weed infestations which are well entrenched, insect populations which are highly mobile and move into Alberta when weather conditions favour spread, and native or introduced plant diseases. Some insects overwinter in Alberta and reach outbreak proportions occasionally usually in a cyclical manner. Because eradication is unlikely, the Branch focuses on mitigation of damage:

- Predator control upon evidence of livestock predation and extension effort aimed at improving management to prevent damage.
- Research to extend the range of pest species controlled by common pesticides or to extend the range of crops which may be treated.
- Development and dispersal of biological control agents.
- Research to assist in development of disease and insect resistant crop varieties.
- Recommendations regarding agronomic practices to avoid pest build up or to reduce pest levels.
- Creation of extension material giving advice on pest control measures, training programs for staff and producers.
- Monitoring and forecast programs, development of field scouting techniques and identification of threshold levels for many pest species.

- Administration of legislation designed to protect producers against the spread of weeds and pests and to protect farmland from severe infestations or the spread of pests.
- Maintenance of records and histories on pest problems.
- Development and implementation of specific and general plans to prevent pest build up, identify control strategies, co-ordinate control efforts and monitor any side effects.
- Providing specific advice to producers and extension staff on a consultative basis.
- Co-ordinate programs and information with other provinces and the Federal Government.

C. Staffing

Crop Protection Branch had 27 permanent positions with one resignation (Paul Van Westendorp, Provincial Apiculturist).

The provincial rat control program is carried out with the assistance of five municipal inspectors under contract to the Branch. In addition, many programs involve intimate co-operation and co-ordination with staff at the Alberta Environmental Center in Vegreville.

BRANCH ACTIVITIES

ENTOMOLOGY, PLANT PATHOLOGY, AND APICULTURE

Responsibility for prevention and control of insects, plant diseases and pests of honey bee remains with the producer as designated in the Bee Act and Agricultural Pests Act. The section's purpose is to develop pest management strategies and programs that reduce losses to pests, improve pest management decision making, and reduce the environmental impact of pest management practices.

A significant change occurred with the transfer of the entomology program from Fairview to Olds. In addition to the physical move, there was a change in emphasis from diagnostics to research. A shift in research occurred from insect pests on grass seed to thrips on barley.

1. Entomology

a. Cutworm and Armyworm Monitoring

The Alberta Agriculture/Agriculture Canada co-operative monitoring project using sex attractants during the seasonal flight period of each pest species was completed for the fifth consecutive year. Table I gives a summary of the average number of cutworm moths caught per trap at each sampling location.

Pale western cutworm infested fields in the southern Alberta counties of Lethbridge, Willow Creek, Warner and Vulcan and destroyed 175 acres of wheat in two fields south of Sedgewick in central Alberta. About 5,000 acres were sprayed in early June. Some fields required reseeding.

Redbacked cutworm populations remained at low levels. Except for gardens and special crops, such as sugar beets, little damage has been caused by this species since the survey began.

TABLE I
ALBERTA CUTWORM SURVEILLANCE MONITORING PROGRAM 1985-1989

Average number of cutworm moths caught per trap.

Location	Pale western cutworm					Redbacked cutworm					Army Cutworm
	1985	1986	1987	1988	1989	1985	1986	1987	1988	1989	1989
Barrhead	0	1	0	-	0	-	546	212	-	938	-
Brooks	463	213	130	142	97	2022	1414	1150	440	800	192
Lethbridge	1320	754	282	304	412	2163	1873	969	1010	1922	1030
Oyen area:											
Oyen	980	961	-	135	-	558	322	-	194	-	-
Empress	-	-	-	-	525	-	-	-	-	525	63
Strathmore area:											
Strathmore	573	646	-	112	-	1592	502	-	630	-	-
Chancellor	-	-	-	-	229	-	-	-	-	701	438
Lyalta	-	-	-	-	29	-	-	-	-	1278	537
Three Hills	788	-	247	742	654	1791	-	1045	774	2127	38
Vegreville	382	128	434	599	144	3055	2925	2418	1084	1456	2
Wainwright	-	-	-	203	236	-	-	-	203	1316	1
Peace River area:											
Eaglesham	-	-	-	-	0	-	-	-	-	382	0
Fairview	0	0	0	-	0	371	1866	2532	-	260	0
Manning	-	-	-	0	0	-	-	-	472	259	0

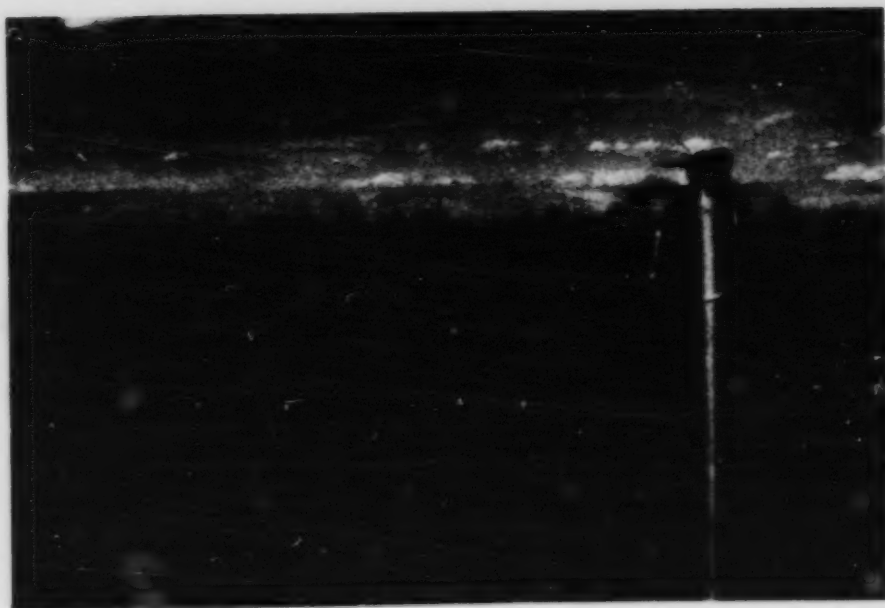
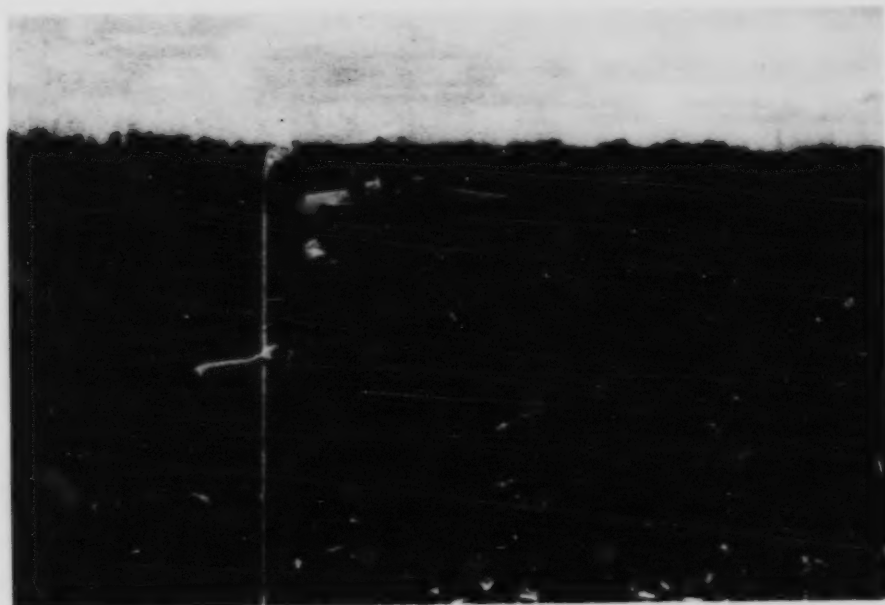
Note: (-) indicates that no sample was obtained. (0) indicates that a sample was obtained but that no moths of the target species were caught.

Army cutworm was included in the provincial monitoring program for the first time. It overwinters as a partially grown larva; damage from this cutworm can occur throughout April, occasionally lasting into May. Winter wheat and fall rye are the crops most likely to suffer damage; pupation is normally complete by the time spring crops emerge.

Army cutworms infested a few weedy summerfallow fields in eastern and southern Alberta. Spray was required on a section of durum near Oyen. This species evidently does not occur in the Peace River area and populations are low in central Alberta. Army cutworms have been monitored at Lethbridge since 1978; catches in the fall of 1989 were the highest to date.

a. Cutworm and Armyworm Monitoring

Pheromone Traps

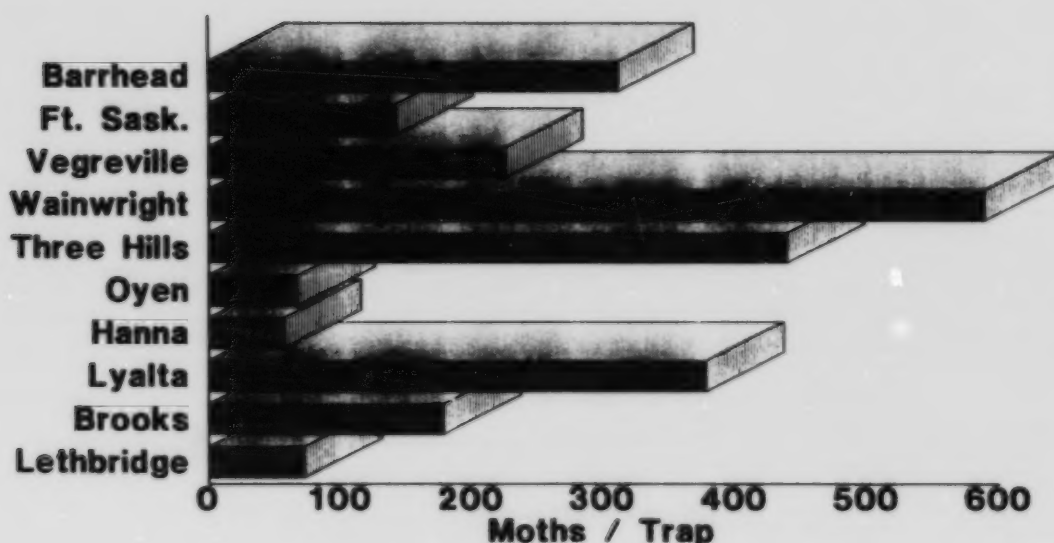


Bertha armyworm were trapped in numbers indicating significant risk of economic crop damage by their larvae in southern and central Alberta (Figure #I). Monitoring was completed July 21 and by July 28 enough samples had been counted to indicate a potential problem existed in some areas in central Alberta. An alert was prepared and released on July 31. An estimated 100,000 plus acres of canola were sprayed (clover cutworms also were present in some fields). Serious crop loss was prevented in nearly all cases.

In the Peace River region, low numbers of bertha armyworm larvae were generally present. One to two thousand acres required spraying in the Eaglesham-Watino area and limited acreages were treated near Spirit River.

FIGURE #I

1989 TRAP CATCHES BERTHA ARMYWORM





Parasites on Bertha armyworm.

b. Aphids

Russian wheat aphid numbers were about four per tiller in early fall, 1988, and decreased gradually to about one per tiller in late December. In early February, air temperatures of -37°C with no snow cover caused aphid numbers to decline to one per 400 tillers. Rain and snow in March and April virtually eliminated Russian Wheat Aphid populations in Alberta.

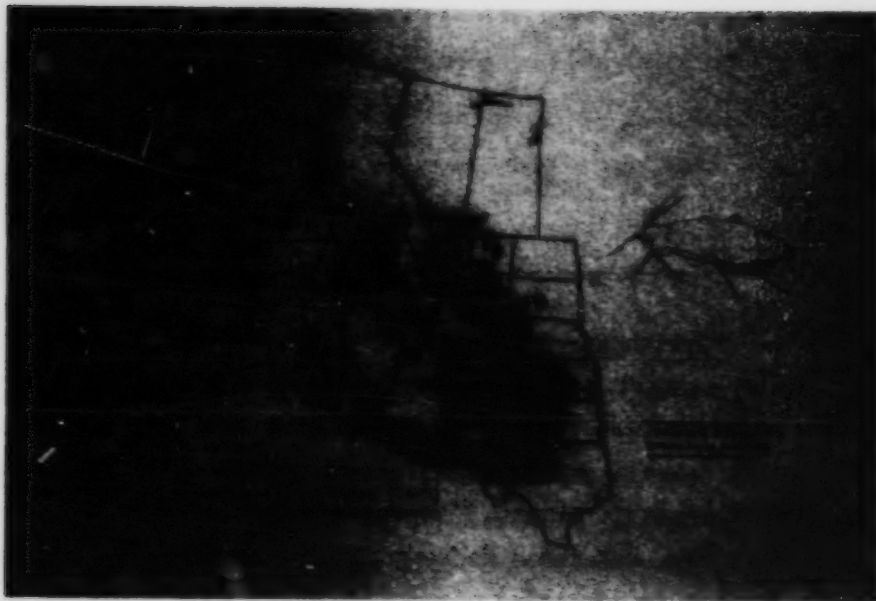
The aphid made a reappearance in early August, at one field of late-seeded barley east of Writing-on-Stone Park. By harvest time, 18% of tillers were infested and a few more fields in Warner and Cardston counties had detectable levels. Rainy, cool weather during August prevented the development of large populations. Nevertheless, by early winter, all fields of winter wheat surveyed in southern Alberta were infested with Russian wheat aphid. No spraying for Russian Wheat Aphid occurred.

Green bug, birdcherry oat aphid and corn leaf aphid were present in moderate numbers late in the growing season throughout southern Alberta. Spraying for aphid control on cereal and grass seed fields was common in the County of Warner.

Potato aphid infested fields in moderate numbers. Although there has been no established economic threshold, limited treatments were applied in southern Alberta.

b. Aphids

Russian Wheat Aphid



Russian Wheat
Aphid Suction
Trap.



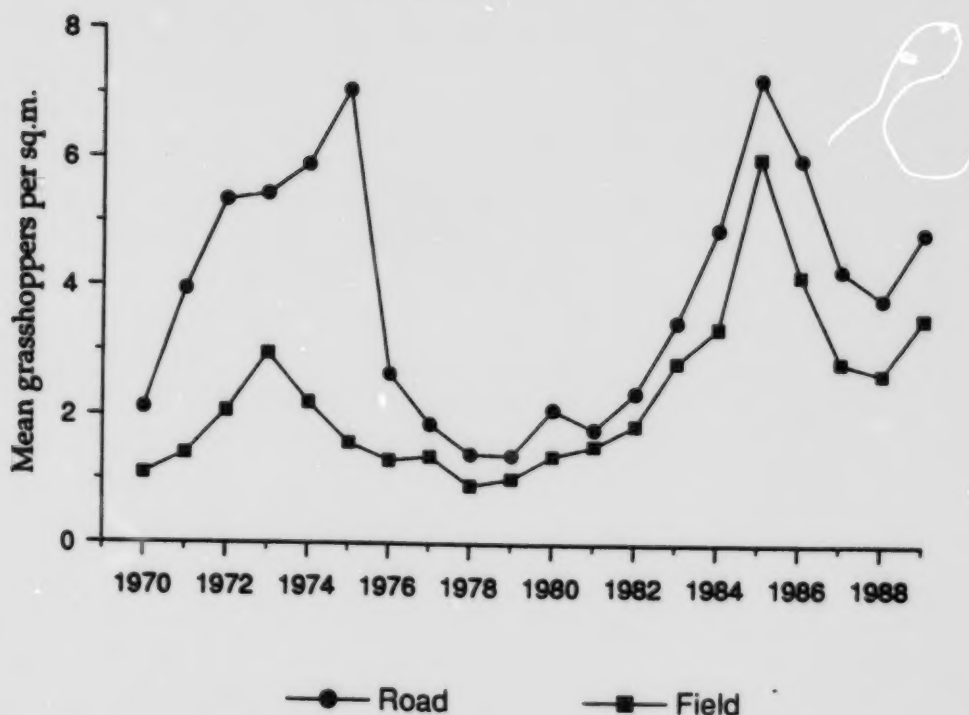
c. Grasshoppers

The overall severity and infestation levels in Alberta remained steady during 1987-1989 (Figure #II). Despite a gradual decline in this pest, small infestations persisted in southwestern and east-central Alberta. Crop damage was reduced by insecticide spraying, but these pockets continued to exhibit the high densities and active migration normally seen during outbreaks.

FIGURE #II

Grasshopper Numbers Based on Annual Survey Results from 1970-1989.

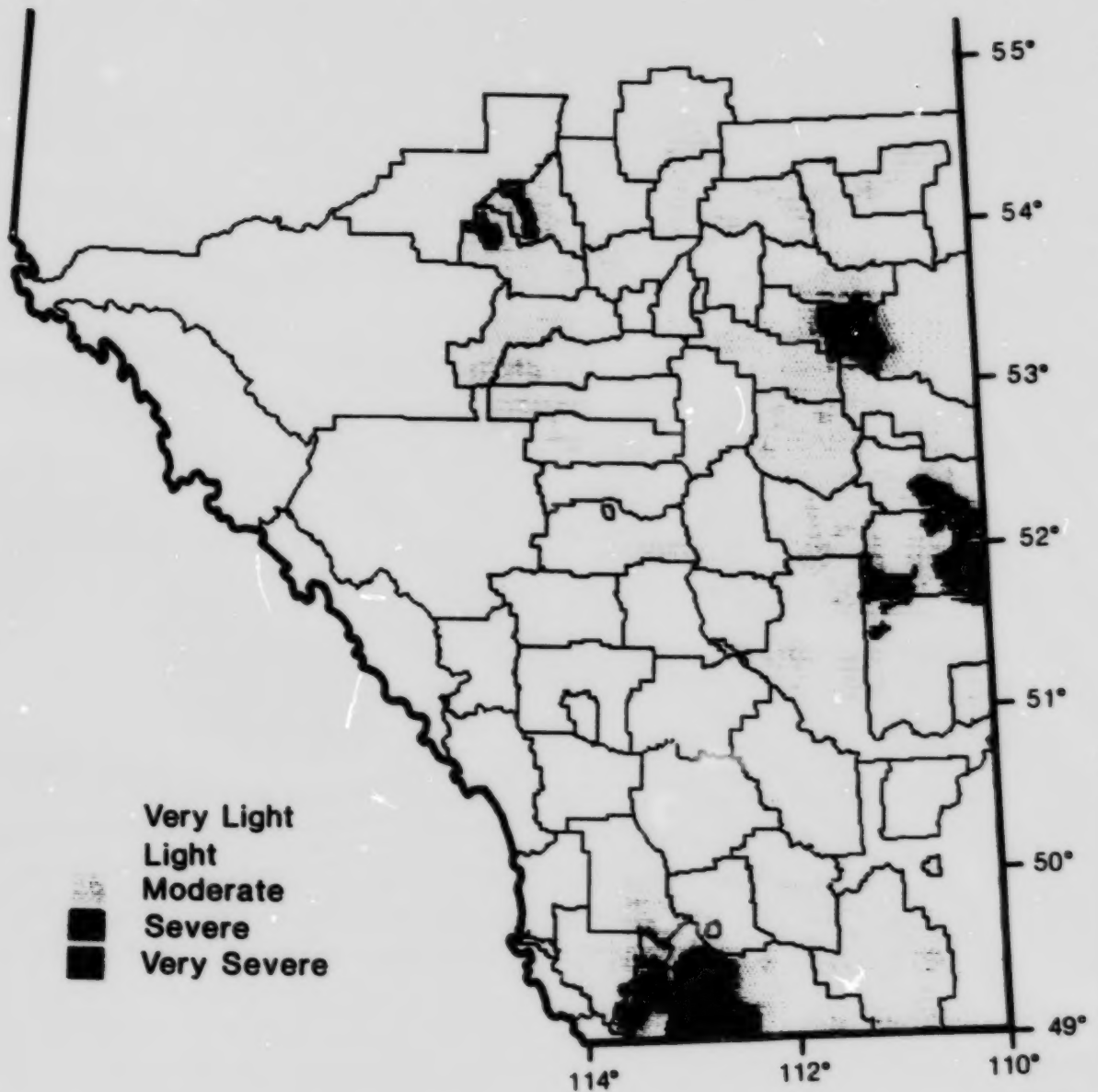
Province of Alberta



The forecast for 1990 (Figure #III) indicates scattered low to moderate infestations in most areas. Localized infestations have become established near Cardston and in Special Area 4 (south of Provost). Average temperatures and below-average rainfall during April-June did not reduce grasshopper survival and these localized infestations were maintained. They will not expand, however, because the extensive rainfall during August reduced breeding success and the infested areas will shrink or remain the same size in 1990. A small infestation in County Eleven (Barrhead) and County Twenty-eight (Lac Ste. Anne) is predicted to decline, because of above-average rains.

FIGURE #III

The 1990 Alberta Grasshopper Forecast



The fungus disease Entomophaga grylli increased in prevalence. It only affected one species of grasshopper. The special "pathotype" of this microbe that attacks the clear-winged grasshopper became common in late summer, apparently affecting up to 30% of this species at some sites. Overall impact of this disease probably reduced the infestations by no more than 10%.

Table II shows a summary of levels of risk for the surveyed area of Alberta. The areas are calculated from map area, and are not field crop area only. The area expected to require management action is similar to the previous three years.

TABLE II
FORECAST RISK OF GRASSHOPPER INFESTATIONS IN 1990*

Legend	Area (%)	Area (km ₂)
Very Light	39.9	74,610
Light	41.5	77,600
Moderate	10.7	20,010
Severe	6.1	11,410
Very Severe	1.8	3,370
	100.00	187,000

* Based on grasshopper breeding density in 1989.

The 1990 grasshopper forecast was conducted by Agriculture Service Board Fieldmen, from 53 municipalities and is based on survey data from 1,680 sites.

d. Grain Stink Bug

At harvest, was found to be heavily infesting a half section of mustard in the Wrentham area of the County of Taber. At the end of August, the population was largely early stage nymphs. The field had been heavily infested with Russian thistle prior to planting. The stinkbug also infested barley grown in strips alternating with weedy summerfallow in the Turin area northeast of Lethbridge. One strip of 100 acres, infested with 20 stink bugs/m² required spraying. Another 1,000 acres of barley at Enchant was sprayed for non-economic levels. At Bow City, southwest of Brooks, 160 acres of strip-cropped wheat, at harvest, was found to be infested presumably by stink bugs. At 8 bu/acre, the field yielded half that of a neighboring, uninfested crop.

e. Beet Webworm

Were numerous and widespread throughout southern and central Alberta from early spring through mid-summer. The day-flying moths were commonly seen along grassy roadsides and in weedy summerfallow fields. Initial infestations occurred on summerfallow. In the Peace River region, beet webworm larvae heavily infested a canola crop grown on summerfallow near Hines Creek.

Beet webworm larvae heavily infested Russian thistle and other weed growth in an 80-acre durum field in the County of Forty Mile in early July. After consuming all broadleaf weeds, the larvae shredded wheat leaves so badly that 10 acres of crop in the middle of the field were lost. In southern and eastern parts of the province, high beet webworm numbers (up to 200/m²) were fairly common but no other damage to cereals was reported.

f. Clover Cutworm

Infestations were severe and were often combined with beet webworms. Canola and flax along the eastern side of Alberta and mustard fields, in County of Forty Mile south of Highway #3, were infested. Toward the end of July, damage to canola occurred in the central Alberta counties of Camrose, Stettler, Castor and Sedgewick, and further to the south in the County of Wheatland. Damage varied considerably throughout the province. White patches in canola fields showed up by late July and some fields left untreated during this period were ploughed under. Generations of both beet webworm and clover cutworm overlapped considerably. Drier eastern and southern regions had heavy weed growth last year and this spring and earlier larval infestations than the central areas; irrigated cropland was not affected. Larval densities $>100/m^2$ were often found in severely damaged crops and in association with weed patches.

g. Diamondback Moth

Was monitored using pheromone traps located at Lethbridge, Brooks and Olds. Very few moths were caught. No larval infestations were reported.

h. Leafhoppers (aster leafhopper and others)

In a few dispersed locations caused noticeable spotting, tipburn and stunting of seedling oats, winter wheat and fall rye in late May and early June. A field near Three Hills was reseeded.

i. Lygus Bugs

Heavily infested a few canola fields in the Peace River region. Damage was not noticed until swathing.

j. Brome Grass Seed Midge

Caused economic damage in the Manning area. A survey of six fields showed a average loss of 18%.

k. Brown Wheat Mite

Populations were lower this year than in the last few years. No economic infestations were reported.

2. Apiculture

a. Apiculture Registration

Beekeepers are required to register both numbers of colonies and all hive equipment in their possession (Table III and Figures IV and V).

TABLE III
NUMBER OF BEEKEEPERS AND COLONIES, 1988 - 1989
(October 31, 1989)

REGION	1988		1989		CHANGE (%)
	BEEKEEPERS	COLONIES	BEEKEEPERS	COLONIES	
OP *	7	1,342	8	1,466	+ 1
1	86	31,779	55	31,109	- 2
2	161	11,660	113	11,338	- 3
3	154	10,113	111	8,076	-20
4	100	18,640	78	17,745	- 5
5	391	49,517	281	46,329	- 6
6	167	53,052	125	46,393	-13
TOTALS	1,066	176,103	771	162,456	8

OP * means non-resident beekeepers who spend the summer in Alberta.

FIGURE #IV

Number of Registered Beekeepers

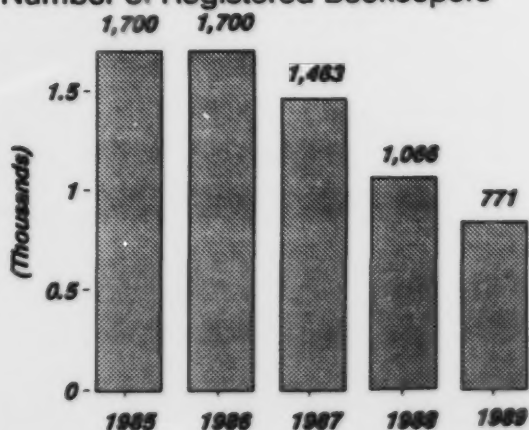
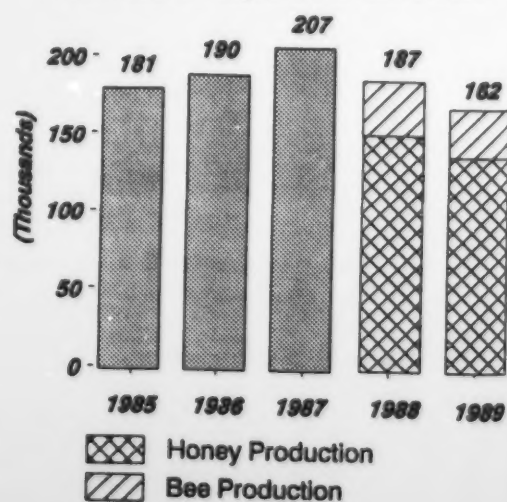


FIGURE #V

Number of Operated Colonies



Since 1987, several factors have contributed to the decline in the number of beekeepers and colonies in Alberta. These factors are both economic and production related. The most significant factors this year were:

1. The discovery of varroa mite in the United States and the consequent closure of the United States border for the importation of bees into Canada.
2. Reduced wholesale honey prices, reduced marketing options and opportunities and high sugar prices.
3. The change in management from packages each year to overwintering colonies.
4. The reduction of available operating credit due to a declining equity value of used hive equipment normally used as collateral.

These factors have caused some commercial beekeepers to leave the industry and others to reduce their operations.

b. Alberta Honey Production 1989

With the reduction in the number of honey bee colonies operating in Alberta, honey production has also declined.

Honey production in 1989 was approximately 17.1 million pounds, a reduction of about eight million pounds from the honey crop collected in 1988. More colonies were also utilized in 1989 to recover winter losses and to increase colony numbers or to produce queens and bulk bees for sale. As a result of these diversifications, the number of honey producing colonies were below 1988 levels. (Figures VI, VII).

FIGURE #VI

Alberta Honey Average Yield
(kg/Colony)

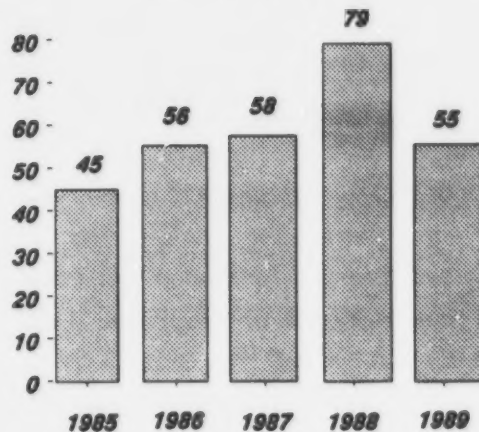
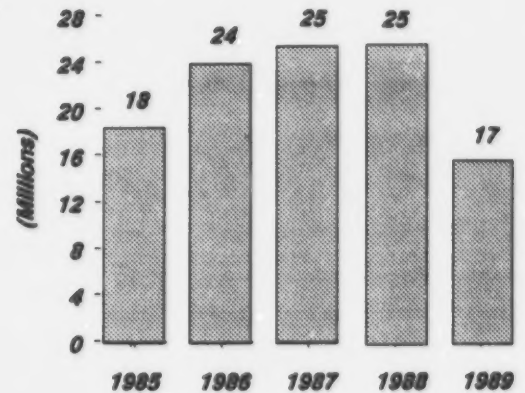


FIGURE #VII

Alberta Honey Production
(Millions of Pounds)



c. Apiculture Inspections and Surveys

During the 1989 inspection season (April 1, to September 30), the Apiculture section employed 6 part-time (wages) field inspectors, 3 part-time lab technicians and 1 full-time, temporary lab technician.

A total of 3,025 colonies were inspected for honey bee diseases in 71 beekeeping operations in 1989. American Foulbrood disease was detected in 23 (32%) operations in a total of 83 colonies. A total of 2,384 brood chambers were examined for sale authorization. American Foulbrood was detected in 168 boxes of brood comb (7.6%) in 10 beekeeping operations. Chalkbrood disease was detected in 206 colonies in 15 operations. No European Foulbrood disease was detected (Table IV).

Tracheal Mite Surveys - Commencing in January 1989 until May, over 10,300 samples of honey bees were collected from 41 beekeeping operations in Alberta. Samples were taken from operations identified as having high risk beestock; that is, beestock that originated in California prior to 1988. Over 75,000 individual bees were examined for tracheal mites.

Seven sampled operations tested positive with tracheal mites. All of these operations are located in the Peace River region.

TABLE IV
APICULTURE INSPECTIONS, 1989

REGION	OPERATIONS	HIVES INSPECTED	AMERICAN		CHALKBROOD		SACBROOD	
			FOULBROOD+ OPERATIONS	EUROPEAN FOULBROOD	COLONIES	BEEKEEPERS	COLONIES	BEEKEEPERS
1	4	168	2	0	4	1	0	0
2	8	114	0	0	4	3	0	0
3	5	91	2	0	5	1	0	0
4	3	146	3	0	0	0	0	0
5	30	2,066	7	0	189	10	3	1
6	21	440	9	0	0	0	0	0
TOTALS	71	3,025	23	0	206	15	3	1

During fall, honey bee samples were collected from 6,262 colonies from 16 beekeeping operations whose owners planned to move colonies to British Columbia for wintering and pollination purposes. Two of the producers were B.C. residents. No tracheal mites were detected.

Varroa Mite Surveys - The surveys for Varroa jacobsoni detection in Alberta were initiated by Agriculture Canada and by Alberta Agriculture during fall, 1989. A total of 57 colonies in 5 operations were randomly selected and treated with fluvalinate (Apistan) strips and sticky boards. All operations were within 32 km of the United States border. No varroa mites were found in Alberta.

The provincial survey for varroa included almost all of the honey bee samples collected in the tracheal mite survey. Each sample was drained of alcohol through a wire mesh filter. The alcohol solution was examined. In total over 9,000 samples of bees

collected from 67 operations were examined for varroa mite. No varroa mites were detected in Alberta.

d. Overwintering Bees

By 1987, approximately 122,000 colonies were wintered both outdoors and indoors, as well as in the southern Okanagan Valley and Fraser River Valley of British Columbia. This represented approximately 64% of operated colonies in 1987. About 151,000 colonies were prepared for winter during fall, 1989. Average winter mortality of colonies varied between 11.7 and 19.0% among the six agricultural regions and was 16.2% province-wide during 1989-1990 (Table V).

TABLE V
WINTERING STATISTICS 1987, 1988, 1989

Year	Colonies Operated	Colonies Wintered	Per Cent of Colonies	Winter Mortality %
1987-88	190,000	122,000	64	15
1988-89	187,000	151,500	80	30
1989-90	162,000	151,000	93	16

Some difficulties were encountered by beekeepers wishing to overwinter their stock in British Columbia. Eventually British Columbia government allowed limited access to some isolated areas on the lower mainland.

Alberta beekeepers continued unsuccessfully to convince the Federal government to reopen the United States border to bee importation. Efforts focused specifically on allowing import of queen bees from Hawaii. This measure was not approved.

Winter bee hives surrounded by an electric bear fence.



e. Government Programs Affecting Beekeepers

Sugar Price Reduction Program - The Sugar Price Reduction Program came into effect in August, 1989, to assist with winter (1989) and spring (1990) sugar costs for overwintered colonies. It provided \$3.00 per 40 kg bag of sugar or equivalent (liquid sugar and high fructose corn syrup). Payment was based on the number of registered colonies in 1989. The program officially ended May 31, 1990.

The price of sugar cost about \$28.70 Canada, for a standard 40 kg bag (Taber-Lethbridge) at the Honey Producer's Cooperative at the start of the program. Current sugar prices were \$30.60 Canada, per 40 kg bag or equivalent.

National Tripartite Stabilization Plan (NTSP) - In May, 1989, the Canadian and Alberta government and industry made a 10-year commitment to participate in a tripartite stabilization plan for honey to reduce the loss of income to beekeepers caused by market price fluctuations.

The program operates on a current year basis ending May 31. The net payout to producers for the 1988 crop was 8.8 cents per pound based on receipt of verified reports of honey sales throughout 1988 and 1989.

All but 15 beekeepers operating more than 500 colonies are registered with NTSP (1989 data total 136).

Advance Payments For Crops (Honey) - In the 1989 crop year, the federal government ceased covering the cost of interest of its loan advances to agricultural commodity producers under the Advance Payment for Crops Act.

3. Plant Pathology

a. Bacterial Ring Rot Program (BRR)

Grower records were obtained by voluntary submissions by potato growers to the Branch and on-site contact with Municipal Fieldmen.

Around 95% of the commercial acreage was inspected for bacterial ring rot to a total of 18,451 acres. The one outbreak of bacterial ring rot in the County of Newell was found in potatoes the grower had planted from his previous year's crop (Table VI). Around 4,000 acres of seed potatoes inspected by Agriculture Canada were bacterial ring rot free and have remained for over ten years. In 1990, the Alberta Potato Marketing Board will supply the Crop Protection Branch with potato acreage records of all members.

TABLE VI
POTATO ACREAGE AND INCIDENCE OF BACTERIAL RING ROT IN ALBERTA - 1989

DISTRICT	NO. OF FARMS		ACREAGE	
	INSPECTED	INFESTED	INSPECTED	INFESTED
Co. of Newell #4	13	1	2986	260
M.D. of Cypress #1	0	0	0	0
M.D. of Taber #14	34	0	11784	0
Co. of Forty Mile #8	4	0	769	0
Co. of Lethbridge #26	5	0	662.5	0
Lethbridge Perimeter	2	0	9	0
Region 2	6	0	123	0
Region 3	3	0	110.5	0
Region 4	1	0	18	0
Region 5	2	0	68	0
County of Sturgeon #90	6	0	1462.5	0
Co. of Parkland #31	1	0	173	0
Edmonton Perimeter	3	0	135	0
Region 6	4	0	158.5	0
TOTALS	84	1	18451	260

Two instances of Bacterial Ring Rot infestations in potatoes obtained from eastern Canada were found at the Lendrum (ASCHRC) research site.

b. Blackleg of Canola

Virulent blackleg of canola was present in eastern Alberta from Bonnyville to Hanna (Table VII). The Peace River region and the west-central areas are still free of this disease.

In a random survey for blackleg in 1989, at least one field for every 5,000 acres of canola was inspected. Every municipality in Alberta participated and in total 834 commercial fields were inspected. In addition, all 626 pedigree canola seed fields were checked during routine seed inspections.

Virulent blackleg was found in 22 of the commercial fields selected in the survey, primarily in east central Alberta. One pedigreed field in east central Alberta was also infested.

TABLE VII
BLACKLEG OF CANOLA SURVEY IN ALBERTA - 1989
Municipalities with Confirmed Virulent Blackleg of Canola

<u>MUNICIPALITY</u>	<u>NUMBER OF</u> <u>FIELDS SURVEYED</u>	<u>NUMBER OF FIELDS</u> <u>WITH VIRULENT BLACKLEG</u>
EAST CENTRAL ALBERTA		
Co. of Paintearth #18	18	2
Co. of Flagstaff #29	30	2
Co. of Beaver #9	42	2
Co. of Smoky Lake #13	5	1
Co. of Vermilion River #24	22	6
Co. of Minburn #27	14	1
M.D. of Provost #52	19	4
M.D. of Wainwright #61	17	3
M.D. of Bonnyville #87	6	1
TOTAL	173	22

Outside of this formal survey a further 43 fields were found to have virulent blackleg from samples of diseased canola sent in by farmers, district agriculturists and research personnel. The confirmed instances of this disease occurred in an additional five municipalities: Camrose, Red Deer, and Special Area #2 (Hanna), Stettler and Two Hills.

While the overall disease level is still low (Table VIII), growers cannot relax in the fight to keep this disease under control.

TABLE VIII
BLACKLEG TESTING OF ALBERTA CANOLA SEED
(Intended For Planting in 1989)

	<u># Of Samples</u>	<u>Virulent*</u>	<u>Negative</u>	<u>Avirulent**</u>
Newfield Seed (Saskatchewan)	325	2	322	1
Norwest Labs	1,436	0	1,242	194
United Grain Growers	539	0	506	33
Total	2,300	2	2,070	228

- * The two positive virulent samples were from seed grown by Research Departments outside of Alberta.
 - ** 10% of canola seed was infected with the avirulent mild form of blackleg.
-

c. Diseases of Cereals

There were significant increases in disease levels in cereal crops compared to recent history. Disease losses were primarily from fungi, but other factors were bacteria, viruses, herbicides, nutrient deficiencies and environmental interrelationships.

Scald and net blotch lesions were common on tillering barley by mid-June and septoria was common on wheat, particularly where barley followed barley or wheat followed wheat. By the second week in July, severe scald was evident on the flag leaves of barley prior to anthesis in west central regions.

Grey speck of oats (manganese deficiency) was occasionally severe on acidic soils. By late July, scald and net blotch of barley and septoria on wheat were moderate to severe even in the traditionally drier eastern regions of central Alberta.

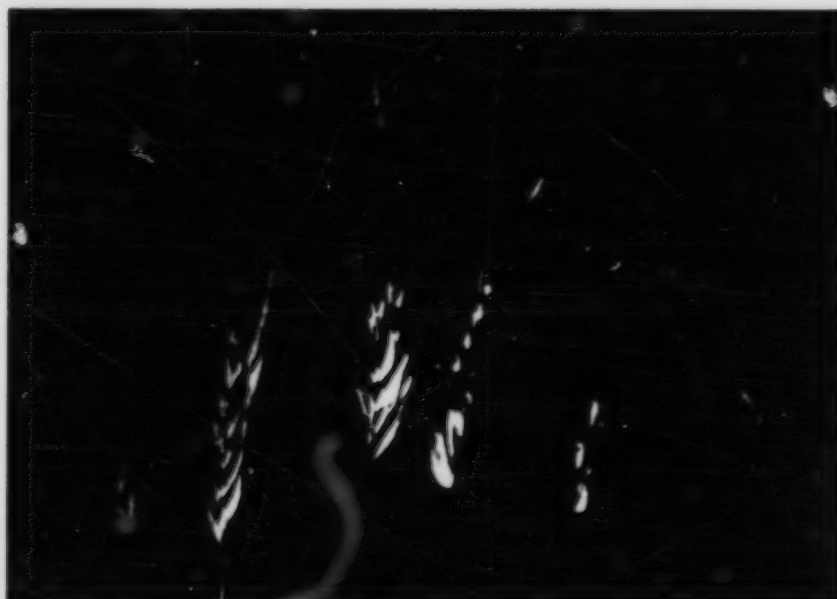
Continued wet weather during August and September in most areas was favourable to foliar fungi and caused losses in quantity and quality in feed and malting barleys. Wheats were affected to a much lesser degree by septoria but take-all levels were considerably higher than usual. In several instances where wheat followed wheat, take-all losses were estimated as high as 50%.

Foliar fungicide trials for control of scald and net blotch (Tilt application trials by Ciba-Geigy) showed barley yield responses of up to 30% in several locations.

Further wet conditions in September resulted in quality loss in the swath along with grain sprouting in all cereals. In standing crops, head breakage was up to 20% or more in many varieties of barley. Most likely head breakage was directly related to the high foliar disease levels that occurred in July and August.

Melanosis in wheat (copper deficiency) was prevalent province-wide, particularly on sandy soils. Weather and soil moisture conditions appear to have been particularly favourable for disease expression. Fields from east to west in the province showed partial to completely affected areas which were obvious in late August. There was also evidence that herbicide application had, in several instances, significantly increased disease severity resulting in major yield loss. Copper deficiency in barley is less obvious than in wheat, but is most recognizable when the plant heads are out, and is depicted by dieback (pigtail) of flag leaves and delayed head emergence.

Analysis of the harvested wheat and barley plots from copper deficiency trials conducted by Soils Branch personnel showed a remarkable correlation with ergot incidence. The copper plot experiments were conducted at four locations in central Alberta. In wheat trials, ergot infestation levels in the grain averaged 28 per square meter for the check plots and one for those plots amended with copper sulphate. There were no



Ergot in wheat.

significant differences between the increment rates of soil applied copper sulphate in terms of ergot expression. The presence of ergot in barley was significant at only one of the four locations due to the lower overall incidence of ergot infection in this cereal crop. The presence of unusual levels of ergot in either of these cereals may be considered a symptom of low or deficient levels of soil copper in wheat or barley crops.

d. Diseases of Oilseeds

Cold soils in May and early June caused considerable thinning of canola stands from seedling blight in central and northern regions. Alternaria blackspot and staghead levels were unusually high on Polish canola by early July in west central and northern regions. Sclerotinia levels were high province-wide with 20% or more stand infections common in Argentine canola. Crops that were sprayed with foliar fungicides (estimated 100,000 acres) showed good sclerotinia control. Unsprayed canola, with high yield potential, occasionally showed around 70% stand infection with sclerotinia.

Wet weather in late August and early September resulted in a continued build-up of alternaria blackspot and sclerotinia infection in the swathed crop. Alternaria causing pod shattering and sclerotinia causing pod rotting, reduced swathed yields of canola up to 30%.

Sulphur deficiency was widespread in canola on grey wooded soils, as evidenced by failure to fill pods and unusually high levels of blackspot. In many locations in central Alberta, particularly on level blacktop soils, root rot was common on canola at 3 to 6 inch depths. This rot was a direct consequence of heavy rains in mid-July (5 to 7 inches) in many central and western areas that caused root smother (drowning) of the crop. Expected 40 plus bushel crops produced 25 bushels or less as a consequence of the flooding damage.

Weather conditions were very favourable for the flax crop. No significant disease problems were reported and yield and quality were good.

e. Pathology Research

1. Evaluation of the Effects of Potassium Chloride on Stand Establishment, Yield and Root Rot of Tobin Canola

This experiment was conducted to determine if chloride from potassium chloride (KCl) fertilizer reduced root rot of Tobin canola and increased yields. The potassium chloride fertilizer formulation was 0-0-60. The chloride component was 0, 9, 18 and 36 lbs./acre. Soil tests indicated that potassium levels were 363 lbs./acre and recommended adding 15 lbs./acre of K_2O for canola.

The fertilizer was banded prior to seeding with the 6 row seeder. Seeding was done on May 11. The Tobin seed was treated with Vitavax RS dual seed treatment. Plots were harvested on September 8.

Stand establishment, yield and root rot levels did not differ significantly among treatments in this study.

2. Effects of a Biological Agent *Bacillus Subtilis* (Quantum) On Stand Establishment, Yield, and Root Rot of Tobin Canola

Damping off and root rot of Tobin canola is caused by a complex of fungi which survive in the soil and on decaying crop residues.

This experiment was conducted to determine if coating the seed with a bacteria species known to be antagonistic to some of the fungi causing root rot would protect the seedling and reduce root rot severity. The bacteria *Bacillus subtilis* is a common organism found in soils in North America. It is applied as a seed inoculant with the seed at planting. The four treatments included untreated seed, Vitavax RS seed

treatment, Vitavax RS + low rate of bacterial inoculum and Vitavax RS + high rate of bacterial inoculum.

Seeding was done on May 16. Fertilizer was banded prior to seeding with the 6 row seeder. Plots were harvested on September 8.

Stand establishment, yield and root rot levels did not differ significantly among treatments.

3. Effects of Seeding Depth, Seeding Date and Seed Treatment
On Root Rot, Stand Establishment and Yield of Tobin Canola

This experiment evaluated the effects of cultural and chemical practices on root rot of Tobin canola. The treatments included two seeding depths (1 and 2 inches), two seeding dates (May 10 and May 30) and treated (Vitavax RS) and untreated seed.

Prior to seeding, fertilizer was banded with the 6 row seeder. Emergence counts were taken on June 5 and June 14. Plots were harvested on September 8.

Yield and stand were higher with treated seed than with untreated seed (Figures VIII and IX) and later seeding (May 30) out-yielded early seeding (May 10) Figure #X.

Stand establishment was higher on plots seeded at a depth of 1 inch than at a depth of 2 inches (Figure #X).

The highest yield was obtained on plots seeded with treated seed on May 30 (Figure #IX).

Root rot levels did not differ among plots.

FIGURE #VIII

1989 Emergence of Tobin Canola Planted at Two Dates with Treated and Untreated Seed.

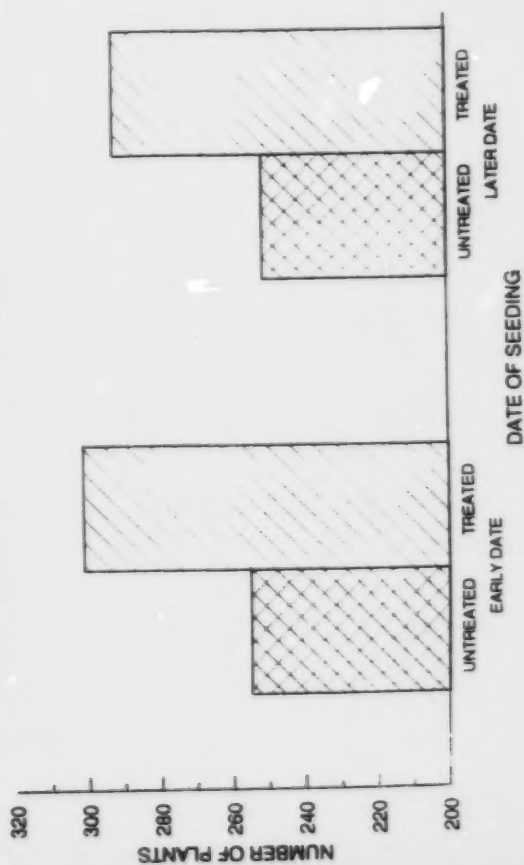


FIGURE #IX

1989 Yield of Tobin Canola Planted at Two Dates with Treated and Untreated Seed.

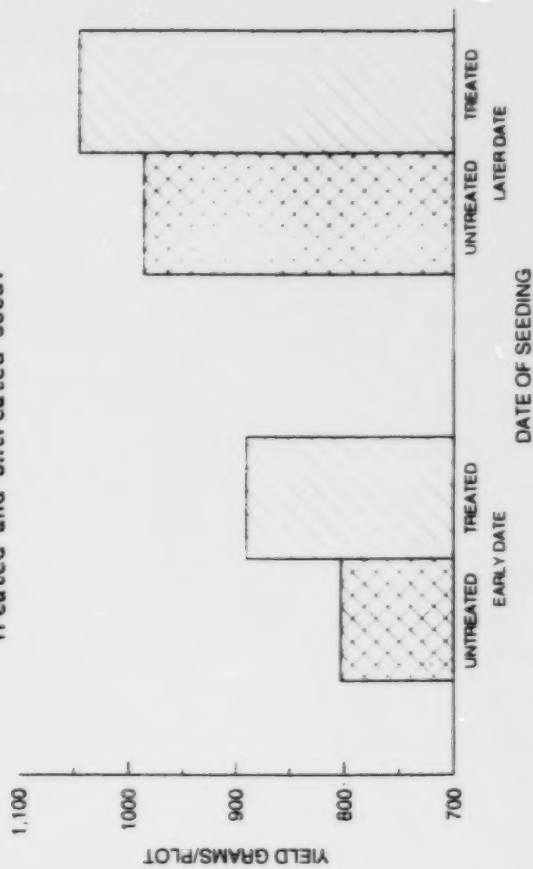
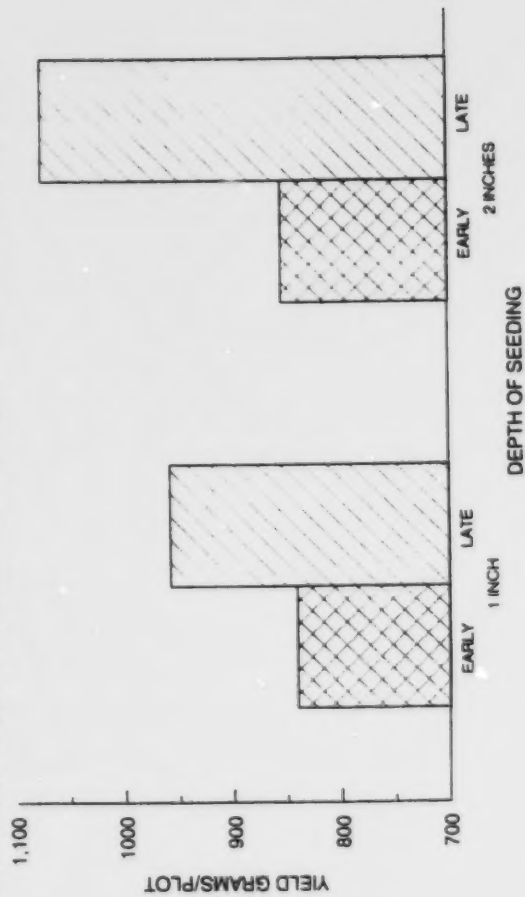


FIGURE #X

1989 Yield of Tobin Canola Planted at Two Depths and Two Seeding Dates.



f. Diagnostics

The Fairview regional crops laboratory continued to serve Region Six in the area of plant pathology and entomology diagnostics. As shown in Table IX, 198 specimens were processed which is a decrease of 22% from 1988. The field crops specimens comprised 40% of the total specimens submitted. In entomology, specimens in the miscellaneous category decreased by 62%. In plant pathology,

TABLE IX
SUMMARY OF SPECIMENS SUBMITTED TO THE FAIRVIEW REGIONAL CROPS
LABORATORY IN 1988 AND 1989.

Crop Category	No. of Disease Specimens		No. of Insect Specimens	
	1988	1989	1988	1989
Field crops	65	60	18	19
Vegetables	20	16	5	4
Ornamentals	56	29	18	21
Shelterbelts	5	0	0	3
Fruits	5	0	0	4
Stored Products	-	-	-	14
Miscellaneous	<u>1</u>	<u>5</u>	<u>60</u>	<u>23</u>
Total	152	110	101	88

specimens in the ornamental category decreased by 48%. The number of specimens received in the field crops and vegetables categories remained constant in both years and continues to be the major component of the disease diagnostics, 69% of total number of disease specimens.

g. Disease Survey (Canola)

A disease survey was conducted on 48 canola fields in the 10 crop districts of Region Six (Table X). The root rot complex was the most prevalent disease affecting 100% of the surveyed fields. Black spot was common with 85% of the fields infested. Prevalence of sclerotinia stem rot was high with 48% of the fields infested. Avirulent blackleg was found in 17% of the fields surveyed. No virulent blackleg was found in the fields surveyed.

TABLE X
PREVALENCE AND INCIDENCE OF ROOT ROT, FOOT ROT, SCLEROTINIA STEM ROT, BLACKLEG AND BLACK SPOT OF CANOLA IN THE PEACE RIVER REGION IN 1989.

Disease	Prevalence (% fields infested)	Incidence (% plants infected)
Root Rot (Rhizoctonia, Pythium, Fusarium)	100	47.6
Black Spot (Alternaria spp.)	85	24.9
Foot Rot (Rhizoctonia, Fusarium)	52	4.6
Sclerotinia (Sclerotinia sclerotiorum)	48	20.5
Avirulent Blackleg (Leptosphaeria maculans)	18	1.6

WEED CONTROL SECTION

The year was both challenging and productive. Technical, environmental and administrative issues were encountered and addressed. The section reassessed current courses of action, increased emphasis on some areas while reducing activity in others. The activities were conducted under increased public scrutiny and with a decreasing supply of assured resources.

Observations:

- The appearance of purple loosestrife on three widely, separated sites has created concern. The aquatic and semi-aquatic habit of this plant creates major chemical control problems and its presence seriously alters duck habitat. No position on this species has been developed to date, as varieties of it have been popular ornamental species for the last forty years.
- Common toadflax continues to increase as a significant weed problem in cultivated land in central Alberta. The use of continuous cropping practices and extended canola rotations appear to be the major reason for its increase. The increasing popularity of continuous cropping means the solution will have to be found within its confines. While research into the management of this weed has been ongoing for the last few years, more will be required.

a. Biological control

Activities have focused on leafy spurge, toadflax, Canada Thistle, perennial sow-thistle and scentless chamomile.

The main effort for leafy spurge focused on the continued re-distribution of the root-feeding flea beetle Apthona nigriscutis to 44 new sites. Establishment success is expected to be high, as in 1988. Twenty of the 29 redistribution releases were established. On the breeding site where the beetle was present at populations of up to 600 insects/m², reduced spurge populations significantly.

Using sheep to graze leafy spurge in the St. Mary's River Valley continued. The sheep herd was increased to 2,300 from 1,300 in 1988. The project has proven to be quite successful in leafy spurge control in an area which is environmentally sensitive to chemical application. The project is a co-operative venture by Alberta Agriculture, Municipal District of Cardston, Public Land Division of Alberta Forestry, Lands and Wildlife, local sheep producers and the Blood Band.

Three insects are being examined for potential to control toadflax; two for Canada thistle; one for sow-thistle; and one for scentless chamomile. All are in the preliminary screening stage.

Collection and screening of pathogens for a wide range weed species is continuing.

b. Research

A significant amount of time was directed to field pea research. Work undertaken with commodity groups was directed at weeds that were a problem in the rotation of which the specific commodity is a key component. Field pea research will continue in 1990 as a great deal of information is required if this crop is to attain its potential acreage.

The number of sites containing sulfonyl-urea resistant chickweed has increased to eight. The increase of resistance in general is cause for concern but the potential of its spread in registered and certified seed is of a major concern. Seed growers have been alerted of this fact. General public awareness and management techniques to avoid or reduce the impact of resistant strains will be more strongly conveyed. Field research on the resistant strains has indicated that the sulfonyl-urea resistant chickweed can be controlled with the usual registered treatments.

c. The Alberta Weed Survey

Completed in 1989 with surveys in Regions two, three and four. With the exception of field horsetail, the results were as expected. The top ranked 30 weeds present in cultivated land are outlined in Table XI. The top 10 weeds as perceived through farmer interviews were wild oats, Canada thistle, wild buckwheat, stinkweed, green foxtail, Russian thistle, hemp nettle, quackgrass, chickweed and redroot pigweed. Perennials such as Canada thistle and quackgrass while not as widely distributed as many other species, are real problems in the mind of producers. Spray calibrations and subsequent incomplete weed control appear to be a

'problem, as only 42% of producers calibrated, the year of the survey, and about 18% have never calibrated their sprayers (Table XII). On the other hand, the majority of pesticide containers are being disposed of quite safely with 61% going to pesticide container sites (Figure #XI). The triple rinsing of these containers would further improve safety.

TABLE XI
THE THIRTY MOST COMMON WEEDS IN ALBERTA FIELDS
(1987-1989)

Rank	Weed Species	Field Frequencies	Minimum No. of plants/m ²	Maximum No. of plants/m ²	Relative Abundance (all fields)
1	Stinkweed	64.960	0.2	1048.4	31.083
2	Wild Buckwheat	70.081	0.2	445.8	30.479
3	Wild Oats	48.787	0.2	643.6	20.681
4	Chickweed	26.415	0.2	978.2	19.550
5	Lamb's-Quarters	47.170	0.2	478.6	17.696
6	Green Foxtail	19.677	0.2	1185.4	16.212
7	Hemp-Nettle	30.458	0.2	272.0	12.584
8	Field Horsetail	31.447	0.2	119.6	12.055
9	Shepherd's-Purse	23.001	0.2	988.0	10.577
10	Russian Thistle	16.173	0.2	518.4	10.436
11	Canada Thistle	35.220	0.2	37.2	8.512
12	Smartweed Species	26.056	0.2	74.8	8.408
13	Narrow-Leaved Hawk's-Beard	21.563	0.2	390.6	7.853
14	Common Groundsel	18.059	0.2	596.2	7.115
15	Volunteer Clover	14.465	0.2	145.2	6.703
16	Redroot Pigweed	19.317	0.2	107.0	5.557
17	Dandelion	21.474	0.2	36.8	5.044
18	Bluebur	16.532	0.2	79.4	4.557
19	Corn Spurry	8.446	0.2	950.8	4.440
20	Volunteer Canola	15.274	0.2	74.2	4.219
21	Quack Grass	14.555	0.2	105.0	3.992
22	Perennial Sow-Thistle	13.657	0.2	51.4	3.595
23	Flixweed	13.028	0.2	102.0	2.773
24	Volunteer Barley	10.153	0.2	61.8	2.691
25	Kochia	8.356	0.2	122.4	2.639
26	Sow-Thistle Species	9.793	0.2	35.2	2.292
27	Rose Species	11.950	0.2	10.6	2.105
28	Tartary Buckwheat	5.660	0.2	78.8	1.978
29	Cleavers	7.457	0.2	49.8	1.861
30	Pineappleweed	7.368	0.2	145.2	1.833

TABLE #XII

Sprayer Calibration*

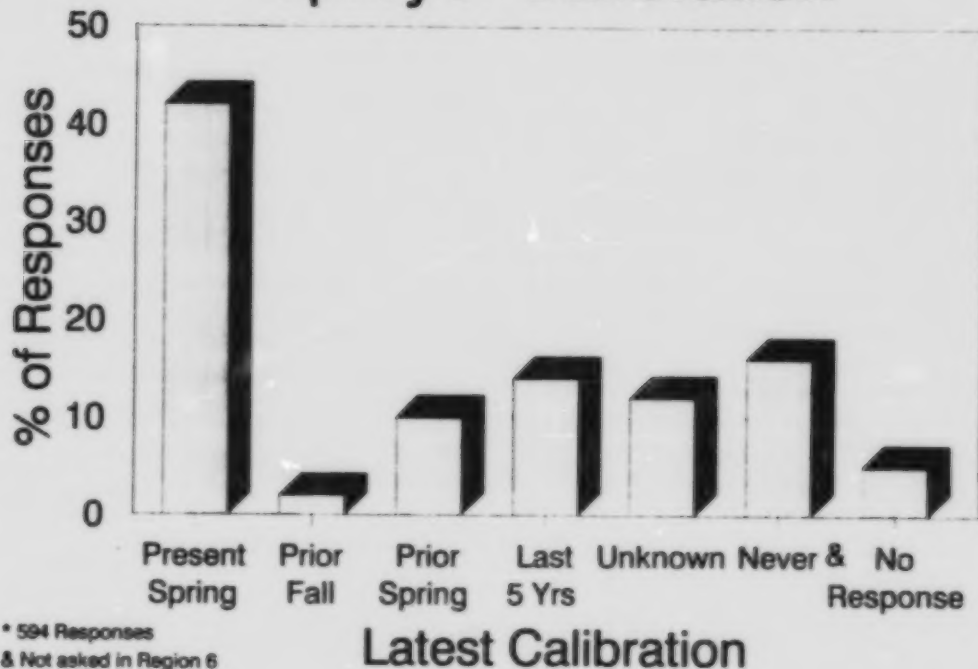
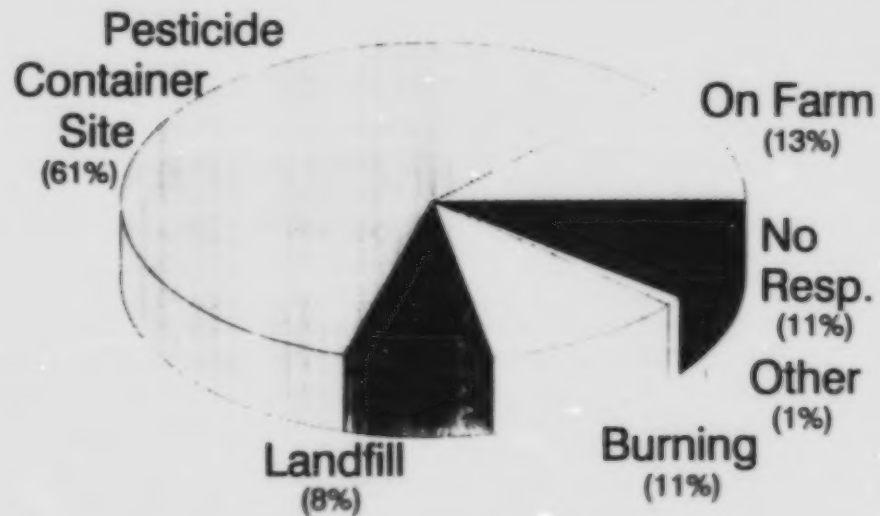


FIGURE #XI

Pesticide Container Disposal



d. The Minor Use Program

Operated in conjunction with the Alberta Forage Council and the Alberta Forage Seed Council. Good success was achieved with Minor Use registrations, primarily on forage crops produced for seed. The combination of 8 herbicides and 12 grass and legume forage species resulted in 29 registrations. Many of these registrations legitimize prior use patterns and now that there is no concern about unforeseen consequences, recommendations are possible. Emphasis in this area will continue.

e. Restricted Weed Control Program

The search and destroy approach for diffuse and spotted knapweed continued. Two new sightings were found in the County of Lethbridge and were treated to prevent seed set. Knapweed free buffer zones were maintained at the British Columbia and Montana borders.

In the fall a new site of knapweed was found in Jasper National Park. Through persuasion and co-operation from park officials, Jasper and Banff National Parks have established programs to survey to determine the extent of knapweed in the parks and at the same time take appropriate clean-up measures. Close contact with the parks will be maintained in 1990.

The nodding thistle eradication program progressed very well and infestation levels are down to isolated plants. No new sightings were reported.

f. Crops of Alberta

Crops of Alberta, a co-operative project between the University of Alberta and Alberta Agriculture, is a display which exhibits the diversity of crops and crop varieties grown in Alberta. "Special Crops" was the theme for this year. The display is used as a teaching aid to many urban elementary school children who tour the site each fall. It also provides a laboratory for plant science

classes at the University of Alberta. Overall, it provides the opportunity for many urbanites to watch the growth, development, maturity and harvest of crops, many of which they are seeing for the first time.



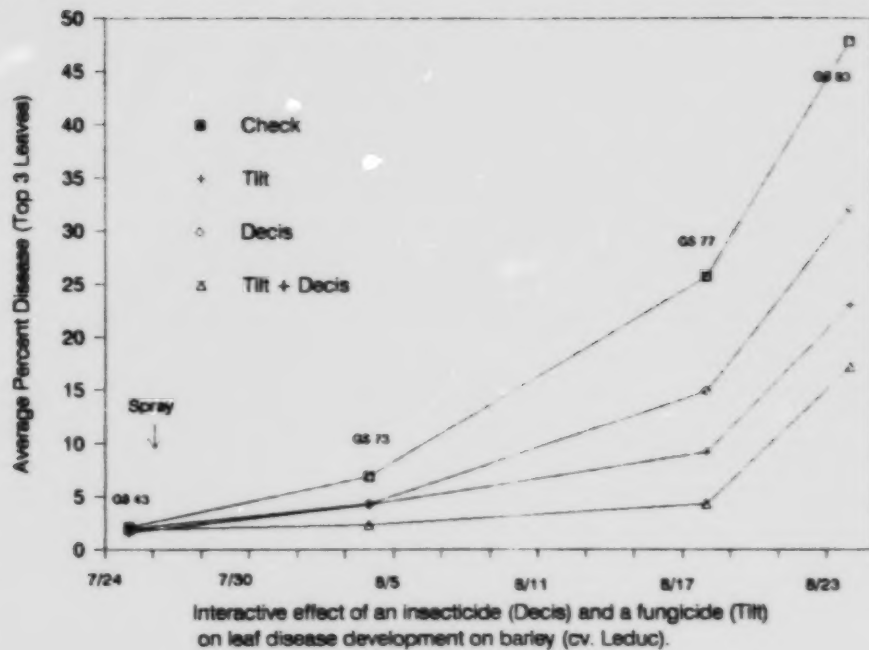
g. Crop Protection Research Centre - Olds

Developmental activities at the Crop Research Centre are progressing well with the main emphasis being on interactive crop protection measures.

Eyespot disease of barley was reported for the first time. Eyespot is a widespread disease of wheat, barley and rye crops in Europe, the USSR, South Africa, parts of North America and Australia (previously unknown in Canada). The disease reduces the yield of the crop through direct effects on the movement of water and nutrients in the host and through indirect effects resulting from lodging. Eyespot can cause yield losses of up to 50% in winter wheat, but is rarely of any importance in spring cereals. A survey of 54 barley fields indicated 90% had eyespot with an average incidence of 24.6%. The widespread incidence of this disease could prove to be a major obstacle to the success of winter wheat production in the Parkland areas of Alberta.

Studies examining the interactive effects of fungicides, insecticides and plant growth regulators were continued. The cereal fungicide Tilt was tested and found to have some insecticidal properties and the insecticide Decis, reduced leaf disease (Figure #XII). Further work is planned to determine whether this is the result of fungicidal properties of the chemical, or whether the cereal thrips controlled by the insecticides either vector leaf diseases or predispose the plant to infection, by rasping the leaves.

FIGURE #XII



PROBLEM WILDLIFE SECTION

The Problem Wildlife Section was involved in three programs: rat control, rabies suppression in skunks, and prevention and control of coyote depredation of livestock and poultry. Responsibility for prevention and control of wildlife depredation of crops and livestock is in co-operation with the producer, with assistance from the Municipal Agricultural Service Boards. Extension services were provided for the prevention and control of crop damage from rodents (primarily pocket gophers and Richardson's ground squirrels), nuisance birds (primarily magpies, blackbirds, sparrows and pigeons) and other mammals that conflict with human interests (bats, rabbits, porcupines, and squirrels).

a. Rabies Vector Control

In Alberta, the primary reservoirs of rabies are the striped skunk, the big brown bat and the little brown bat. However, bat rabies tends not to spread to terrestrial animals, so bat control for rabies is normally not necessary. Skunk control programs to prevent the spread of rabies are undertaken by municipal and provincial staff, and coordinated by Alberta Agriculture, as directed by the Central Rabies Control Committee. Skunks are generally recognized as a beneficial wildlife species. Thus, Alberta Agriculture only advocates population reduction of skunks in areas where rabid skunks have been diagnosed and in control zones along the Saskatchewan and Montana borders.

Twelve skunks and 6 bats were diagnosed to have rabies (Table XIII). The distribution of rabies were; 6 rabid skunks in the County of Warner, south of Raymond near the Milk River Ridge; 3 rabid skunks in the Municipal District of Cardston, south of Magrath, near the Milk River Ridge; and 2 rabid skunks in County of Forty-Mile, one near Manyberries, and the other adjacent to the United States border; and one rabid skunk in the Municipal District of Cypress near Medicine Hat.

TABLE XIII
RABIES POSITIVE ANIMALS IN ALBERTA

<u>YEAR</u>	<u>SKUNKS</u>	<u>BATS</u>	<u>OTHER</u>	<u>TOTAL</u>
1980	54	11		
1981	23	9	1 cat	66
1982	43	7	1 dog	33
1983	32	5	1 horse	52
1984	7	5	3 cats	40
1985	8	4	1 dog	13
1986	1	5	1 human	13
1987	33	7	0	6
1988	19	8	2 cats/2 cows	44
1989	12	6	1 cow	28
			0	18

Skunk control continued along the Alberta-Saskatchewan border, mainly south of the south Saskatchewan River. Along the Montana-Alberta border, a skunk control zone was established in 1989 to reduce rabies influx from the United States.

During 1989, all rabies control was in southern Alberta, south of the south Saskatchewan River and Red Deer River, where a total of 746 skunks were removed. Of these, 600 or 80% were taken using eggs baited with strychnine. Trapping and shooting accounted for 146 skunks. In all, 2,772 poisoned eggs were placed at 1,335 sites, usually in small culverts or under abandoned farm buildings. Strategic placement of these poisoned baits added to the safety of the program and reduced non-target poisoning to only 9 recorded cases: 3 fox, 3 badger, 2 raccoons, and 1 coyote. Bat rabies was sporadic with 6 confirmed cases in 1989.

b. Coyote Damage Control Program

The primary objective of the coyote damage control program is to minimize livestock losses by providing training, resources and assistance to farmers. The program is structured so farmers can solve predation problems with guidance and help from municipal and department personnel.

The branch is striving to foster an integrated and balanced approach to livestock predation control by incorporating non-lethal prevention and management measures with traditional lethal coyote controls. Farmers are expected to take a more co-operative role and share in the management of livestock predation.

The program operates at the municipal level through the agricultural service board. Municipal agricultural fieldmen are the first avenue of help for farmers with predation concerns. Problem wildlife specialists train and provide material and devices to agricultural fieldmen. They also work cooperatively with agricultural fieldmen and farmers to resolve coyote predation and to develop strategies of predation management for individual farmers.

Farm management practices such as carrion disposal, fence maintenance, night confinement of sheep, supervision of expectant livestock and young, and confinement of poultry are emphasized as important factors to discourage predator problems.

Non-lethal predator control measures are promoted, especially for sheep producers with persistent coyote predation. Electric fences and livestock guarding animals have proven effective in many instances and are used throughout North America. Many Alberta sheep farmers have built electric fences for predator control. Of 23 sheep farmers surveyed, 21 rated their electric fence good to excellent for predator control.

Two demonstration electric fences equipped with state-of-the-art equipment and technology were constructed at Olds College. These fences are to be used to train farmers in preventing coyote predation.





The coyote damage control program continued to rely on toxicants and other restricted devices to remove problem coyotes. Safety, correct placement and judicious use of devices were emphasized to protect the user, other humans and non-target animals. The department continued to advocate selective and limited use of lethal devices to destroy coyotes, while encouraging alternative non-lethal predation control measures.

Cyanide guns and strychnine baits are important tools for coyote control (Table XIV). However, single lethal dose 1080 baits, registered for use in 1984, have become the most commonly used toxicant. In comparison to strychnine, 1080 baits are more target specific to coyotes and less hazardous to humans, domestic animals and other wildlife.

TABLE XIV
TOXICANTS AND DEVICES DISTRIBUTED FOR COYOTE CONTROL, 1989

Year	Cyanide	Strychnine	Single Dose	Snares
	Shells	Cubes	1080	
1984	1,175	4,184	147	-
1985	873	2,609	346	-
1986	482	2,166	558	141
1987	565	1,567	1,769	93
1988	696	1,285	2,658	114
1989	481	1,493	3,161	131

* The use of large multi-dose 1080 baits, set in winter for population reduction of coyotes, was discontinued in 1989.

The number of predator complaints investigated by our staff decreased from 254 in 1988 to 190 in 1989. Most predation complaints are initially referred to agricultural fieldmen. Most complaints investigated are in response to agricultural fieldmen requests for assistance or follow-up on farmer consultation. Most investigations involved coyote predation of sheep and young calves (Table XV).

TABLE XV
NUMBER OF PREDATOR COMPLAINTS INVESTIGATED
BY PROBLEM WILDLIFE STAFF, 1989

PREDATOR	PREY					Totals
	Sheep	Cattle	Hogs	Poultry	Other	
Coyote	90	68	3	10	3 ^b	174
Dog	5	4	1	0	0	10
Wolf	0	1	0	0	0	1
Other	1(bear)	0	0	4 ^a	0	5
TOTALS	96	73	4	14	3	190

(a) 1 fox, 3 racoon

(b) 2 goats, 1 ranched deer

The number of cases of predation handled by Agricultural Fieldmen increased in 1989 as did the amount of toxicant used for coyote control (Table XVI). Greater emphasis was placed on having municipal agricultural fieldmen respond to predation complaints.

TABLE XVI
TOXICANTS USED FOR COYOTE CONTROL BY AGRICULTURAL FIELDMEN, 1989

<u>Year</u>	<u>Cases</u>	<u>Number of</u>	
		<u>Toxicants Used</u>	<u>Toxicants/Case</u>
1984	520	4,125	7.9
1985	528	2,933	5.6
1986	398	1,945	4.9
1987	513	2,530	4.9
1988	619	3,453	5.5
1989	706	4,090	5.8

c. Rat Control

Rat exclusion was successfully continued for the 39th consecutive year. The program was accomplished in co-operation with the seven municipalities in the 600 km long and 30 km wide control area along the Alberta-Saskatchewan border from Montana to Cold Lake.

A long cold winter, and increased prebaiting activities, contributed toward eliminating and preventing many rat infestations. Use of dry cereal bait, warfarin bait and water soluble warfarin bait declined. The use of single dose anticoagulants remained constant.

Rat bait given to farmers in the rat control zone, to municipalities, and to the City of Lloydminster amounted to 900 kg of dry warfarin and 250 units of water soluble bait.

Municipal and provincial pest control inspectors conducted 6,542 inspections at farms, grain elevators and other inspection points in Alberta. Each inspection site was visited from one to three

times during the year and suspect or known infestations were rechecked as many as a dozen times. Alberta inspectors also inspected 1,673 sites in Saskatchewan (from M.D. of Wainwright and the County of Vermilion River).

Forty-two infestations were discovered in the control area and eradicated through the cooperative efforts of residents, municipal Pest Control Inspectors and government personnel (Table XVII).

TABLE XVII
NORWAY RAT CONTROL ON THE ALBERTA-SASKATCHEWAN BORDER 1989 - 1990

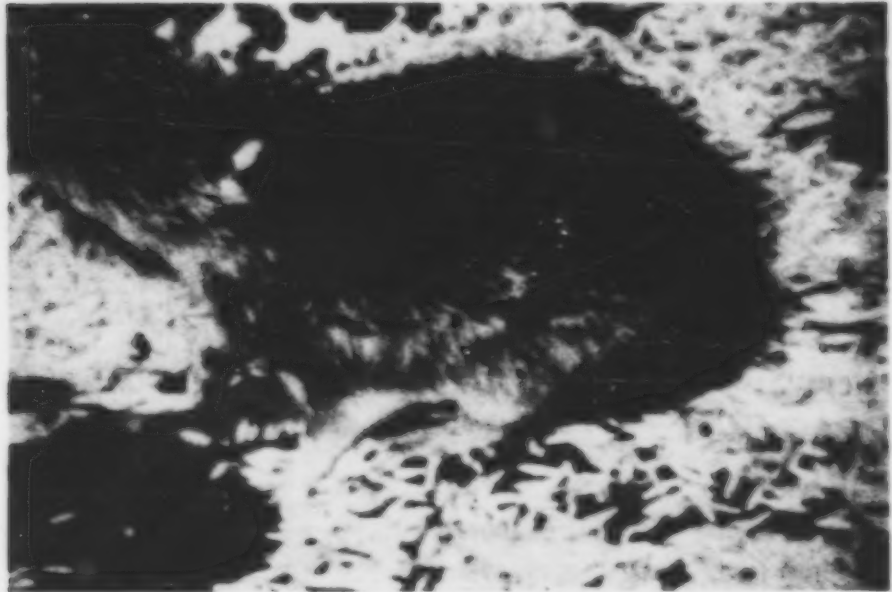
MUNICIPALITY	PERSON YEARS	----BAIT USED----		NO. OF PREMISES INSPEC- TED*	INFESTATIONS		
		DRY(kg)	WATER SOLUBLE		1987	1988	1989
Bonnyville M.D.	0.50	228	0	1376	1	1	0
Vermilion River	1.75	2638	282	2683	66	43	34
Wainwright M.D.	1.0	1001	130	789	0	2	1
Provost M.D.	1.0	2495	796	1694	26	19	7
TOTAL	4.25	6362	1208	6542	93	65	42

* Premises in Alberta only

A point-of-interest road sign was erected along highway 16 near Lloydminster. The sign was designed to increase public awareness in rat control and inform travellers about the control program in Alberta. The Department also produced and distributed rat control posters and bumper stickers. This publicity generated media interest which resulted in over a dozen radio, newspaper or T.V. articles.

Several suspect rat sightings outside the rat control zone were reported to the Department. Although all sightings were quickly followed-up, only two were confirmed rats: one was a black or roof

rat in Vegreville and one Norway rat in Edmonton. In another incident, a transient resident in Lacombe county was reported to authorities for possessing a "pet" rat. This animal was subsequently destroyed by local police in cooperation with the owner.



Most rat sightings were found to be either juvenile or migrating muskrats, or field rodents such as pocket gophers, ground squirrels or field mice.



Point of interest sign
erected along Highway
16 near Lloydminster.
Rat Control Personnel:
Don Dallyn, M.D. of
Wainwright; Larry
Anderson, County of
Vermilion River; Bette
Dallyn, M.D. of
Provost; Orest Popil,
County of Vermilion
River; Les Anderson,
Special Areas and
Hanna; Bob Winther,
M.D. of Bonnyville.

TRAINING

Staff generally have two functions in the area of training; 1) to train Alberta Agriculture and municipal staff in areas related to crop protection, and 2) to act as a resource on numerous topics for extension training sessions at the regional, municipal and district levels as requested and/or time allows.

To ensure field staff are able to convey current weed, insect, plant disease and vertebrate pest management strategies to farmers, a Crop Protection Update was again offered and attended by district agriculturists, agricultural fieldmen, specialists and industry

personnel; total attendance was 169. The two day training session was held in conjunction with the Agricultural Fieldmen's In-Service Training Course and included such topics as weed resistance to herbicides, blackleg of canola, the interaction between nutrient deficiencies and plant diseases, biological control of weeds, Russian wheat aphid, coyote control, the interaction between conservation practices and pest control as well as other timely topics.

Training of weed inspectors continued with over a total of 150 inspectors from both rural and urban municipal governments at six weed inspector schools (one per region). Training concentrated on interpretation and effective use of the Weed Act, proper enforcement, weed identification and the survey for blackleg of canola.

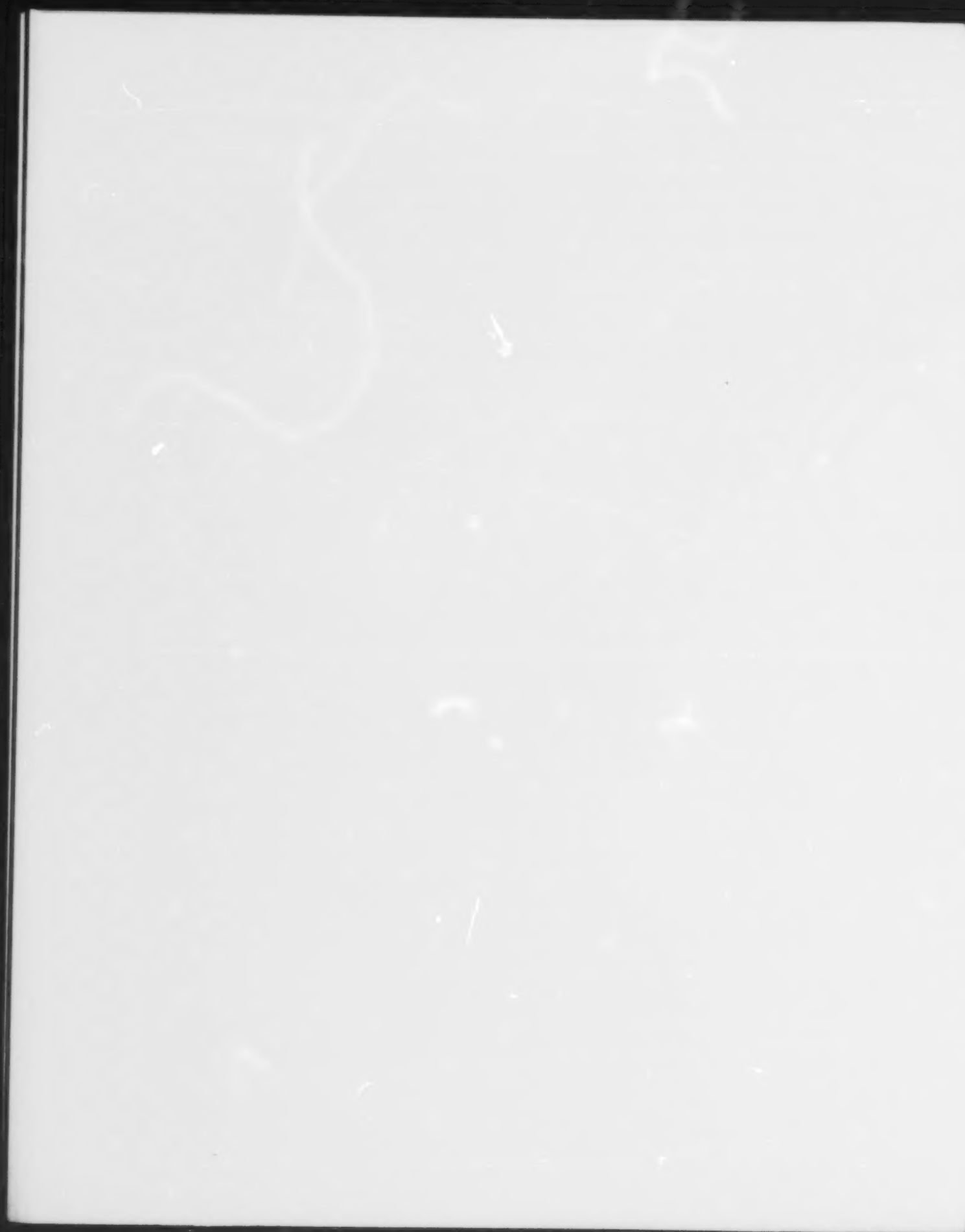
Plant disease training sessions on blackleg of canola were conducted province wide. The annual bacterial ring rot of potatoes training program for municipal staff was held at Brooks.

Technical sessions on plant diseases were also held for Private Agrochemical Companies such as Cargill, Uniroyal and Rhone Poulenc. A total of approximately 70 extension and training sessions were held province wide including the Peace River region.

Training in entomology included numerous presentations at seminars and meetings on topics such as the Russian wheat aphid, insect pest management and identification as part of the Crop Protection Workshop at Lethbridge in July, assessment of yield loss to insects in cereals and oilseeds for Crop Insurance Adjusters, insect pests of alfalfa for the Alfalfa Seed Producers Association, and other insects such as stinkbugs, stored grain, household and garden pests.

Apiculture staff presented five bee disease control workshops across Alberta and co-sponsored along with Fairview College honey bee tracheal mite symposiums at Fairview and Edmonton.

Problem Wildlife staff conducted one day training and update programs for agricultural fieldmen and district agriculturists in each Region. The training included proper use of toxicants with a major emphasis on prevention of predation. Three major seminars were conducted at Spring Coulee, Strathmore and Stony Plain. They focused on use of electric fences and guardian animals to protect sheep. Additionally, staff made a presentation at each regional Service Board meeting to encourage the adoption of preventive approaches to predation management.



FIELD CROPS BRANCH

Summary

The Field Crops Branch has two operational sections - Crop Production and Crop Research, with a full-time staff consisting of 17 permanent positions and 9 temporary salaried positions.

The Branch is involved in province-wide crop extension and research relating to cereals, oilseeds, special crops, forages and seed technology.

The research section's mandate is to develop improved varieties of feed grains with emphasis on feed barley. Programs are also conducted in spring and winter triticale and winter wheat for central regions of Alberta.

Co-operative research is conducted with the University of Alberta, Agriculture Canada and the Agriculture Environmental Centre, Vegreville, to evaluate varieties of oilseeds and cereals adaptable to Alberta.

The production section provided extension programs through department staff, private industry, producer groups and directly to producers.

The municipal co-operative seed cleaning plant program for replacing and upgrading 79 plants is co-ordinated through the production section.

BRANCH ACTIVITIES

Crop Production Section

a. Cereal Crops

The publication "Varieties of Cereal and Oilseed Crops for Alberta" was revised, updated, and distributed through the "Farm Light and Power" February issue, and Agdex 100/32 at district offices. The information presented in this publication is based upon our extensive regional variety testing program to aid farmers in selecting the most suitable varieties for their areas.

During this year requests for speaking engagements totalled - 14; radio and T. V. programs - 28; with numerous news releases, letters, and phone calls on a variety of cereal crop production topics.

The major extension demand this year was in barley (particularly hulless), hard red spring wheat, oat and semi-dwarf wheat and semi-dwarf barley production. Interest remains high in minimizing cash inputs, but to still receive the greatest economic return possible.

This year marked the formation of the Oat Producers Association of Alberta. They have had a very successful first year ensuring that the oat farmer's voice is heard in government and industry.

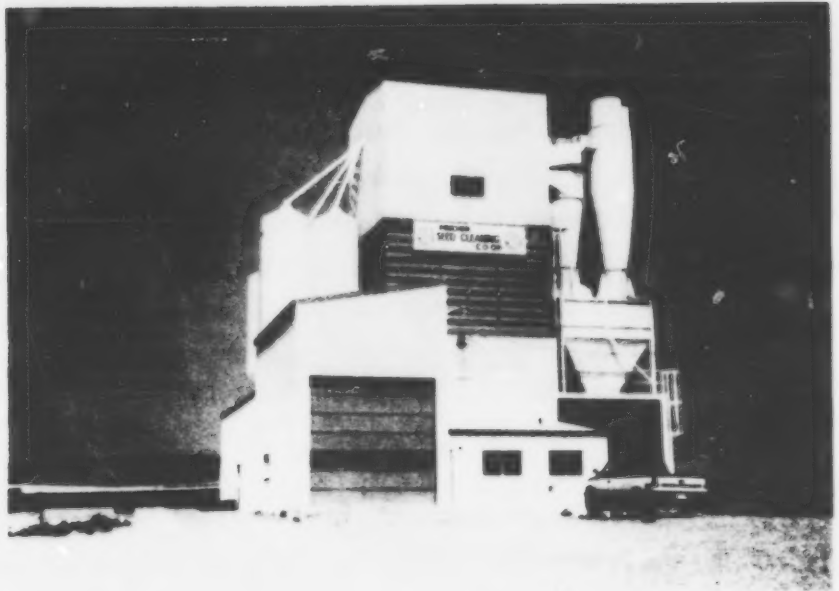
Seventy-eight municipal co-operative seed cleaning plants processed 34 million bushels of cereal grain and oilseeds for the year ending June 30, 1989. This set a new record, an increase of 3.6 million bushels from the 1987-88 year, and 5.4 million bushels above the previous five-year average.

Table XVIII shows the amount of seed processed in 1989.

TABLE XVIII	
GENERAL SUMMARY (BUSHELS)	1988-1989
Total cleaned for Commercial Seed	24,309,133
Total cleaned for Pedigreed Seed	<u>2,577,128</u>
Total cleaned for Seed	26,886,261
Total cleaned for Dockage Removal	<u>7,061,567</u>
TOTAL PROCESSED	33,947,828
Average grain processed per plant - 1989	435,000
Previous five-year average grain processed per plant	374,000

Thirty six seed plant upgrading grant applications were processed for a total of \$419,393. This compares to 34 applications totalling \$364,021 from last year. The 419,393 dollars of grant money paid out translates into 1.4 million dollars worth of upgrading expenditure by the 36 plants in Alberta at our 30% cost share level. This continues to be a very popular, worthwhile program.

One new seed plant was constructed at Pincher Creek and one new replacement plant at Rycroft. The Rycroft plant cost approximately 1 million dollars and a new mini-plant design was built at Pincher Creek for around \$500,000. These plants were cost shared for a total budget expenditure of \$600,000. Future plants planning on replacement are Boyle in 1990-91, Three Hills in 1990-91, Queenstown in 1992-93, Radway in 1993-94, and Coronation in 1994-95. Our provincial replacement program provides technical and financial assistance to these plants, each of which will cost about 1.2 to 1.3 million dollars.

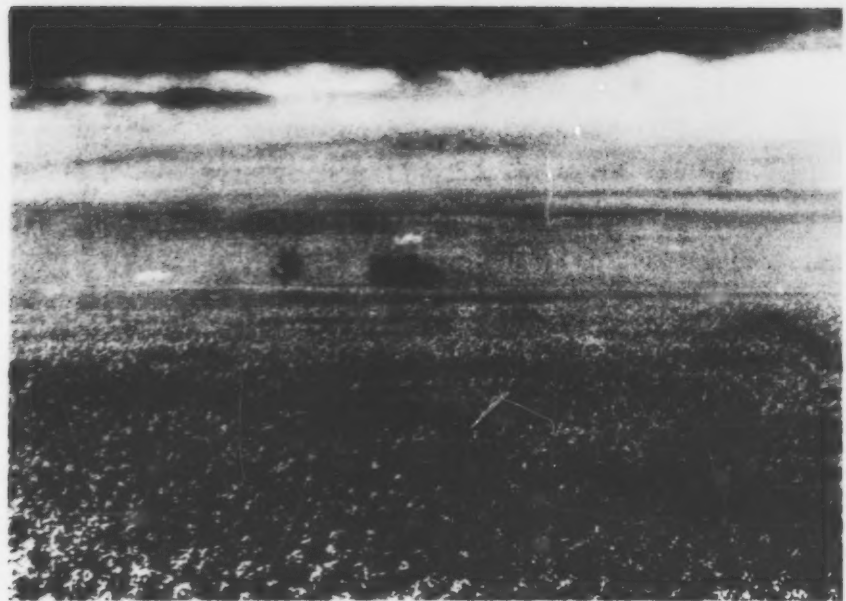


b. Oilseed Crops

Principle activities were directed towards oilseeds technology transfer through over 39 production meetings and field tours attended by 1,800 growers and industry representatives. On-farm demonstrations were held, media releases prepared, and in-service agronomic training seminars put on. Numerous articles and materials were prepared and assembled for regional and district staff, educational institutes and commodity groups. Growers and industry were very supportive of these activities.

Close liaison was maintained with oilseed organizations, crushers and exporters to facilitate communications within the oilseed complex and provide resource information. Two Alberta canola industry meetings were held to discuss the common concerns of the canola industry with researchers, crushers, producers, seed growers, grain handlers, and government. Input, direction and assistance were provided to various crop production clubs throughout the province.

Close liaison was maintained with Agriculture Canada regarding the Canada/Alberta canola breeding project at Beaverlodge, Lethbridge and Saskatoon, as well as other Farming For the Future, federal and university oilseed research projects. Direction and assistance was provided to Monsanto, Du Pont, Biotechnica Canada, Potash & Phosphate Institute, GARST Seeds, Grow Tec, and Rhone Poulenc in their respective canola research programs. Canola breeding programs, both private and public, have rapidly advanced with the registration of 16 new varieties in the past two years. Several of these varieties will be advantageous to Alberta growers through improved disease tolerance and superior yields. Agriculture Canada research on canola seedling vigor has indicated significant differences in stand establishment and yields between various certified seed lots. This continuing research could have a positive impact on identifying for seed growers, those production factors which improve certified seed viability and vigor.



Participation in the Flax Council Research and Technical Committee, the Canola Council of Canada Crop Production Committee, the Alberta Canola Producers Commission Research Committee and the Western Canada Canola/Rapeseed Recommending Committee provided direction to flax and canola research projects relevant to Alberta growers' needs and concerns. The Canola Council's Grow With Canola program provided Alberta canola growers with timely and useful production technology via on-farm demonstrations, grower field tours and production seminars. Five years of the Grow With Canola program have clearly shown that, even under stress conditions caused by drought, the adoption of proven production technology by co-operating growers results in yield increases over normal production practices. Input and direction was provided to the Grow With Canola program including agronomic research projects on sclerotinia stem rot, blackleg disease, seedling vigor, soil fertility, weed control tillage, and seeding practices.

Staff presented an Alberta Agriculture brief to the Alberta Research Institute regarding their oilseeds research review and participated in a Canadian International Development Agency India Study Mission to Canada to learn and evaluate Canadian oilseed technology transfer systems.

c. Perennial Forage Crops

Local forage associations and the Alberta Forage Council remained active. The forage associations were supported with provincial operating grants totalling \$310,900. Popular forage association activities included extension programs such as forage production seminars, tours, forage papers, field plots and major projects to develop whole management systems. An example of the latter is the Pembina Forage Association cow-calf pasture which demonstrates good tame pasture mixtures, fertilization, rotational grazing, and beef cow herd management on a practical farm scale.

Close contact and co-operation was maintained with local forage associations. This included participation in seminars and projects such as Farming for the Future on-farm demonstration projects. A Plant Industry Division staff member participated as a director on the Alberta Forage Council and worked closely with them to assist in the development and activities of this organization. Close contact and liaison was also maintained with the Canadian Forage Council by a Plant Industry Division staff coordinator representing Alberta.

Interest in adapting modern technology by the Alberta forage industry continued as in past years. Popular tame forage extension topics included intensive pasture management, fertilization, forage species and varieties, and densified hay production. Technical information to department staff included seminars and tours.

Tame hay acreage in Alberta was down slightly, 4,600,000 acres in 1989 compared to 4,650,000 acres in 1988. Hay production was 9,800,000 tons in 1989 compared to 10,000,000 tons in 1988. This

is 29% of total Canadian tame hay production. Regions with very low hay and pasture yield due to drought were areas south of Wainwright including Provost, Oyen and Hanna, and south to Medicine Hat. Other eastern and southern areas were generally average to below average in yield. Peace River yields were also average to below average. Hay yields were generally average to above average in central and western Alberta. Hay quality was below average in areas with good yields due to rainfall during the harvest season.



Processed forage production continued to increase. Alberta alfalfa pellet production for the 1988-89 processing year was 274,000 tonnes compared to 184,000 tonnes for the previous year. Alfalfa cubes showed the largest increase with Canadian production increasing to 169,000 tonnes compared to 121,000 the previous year. Alberta cube production continues to make up about 90% of total Canadian production. Densified hay production, although still a fledgling industry, increased about 50% from the previous year to 10,000 tonnes. Information to assist farmers in producing appropriate timothy and alfalfa hay quality for export was compiled by the Division.

d. Annual Forage Crops

Annual forages consist of annuals for pasture and annuals for silage or hay. Cereals, both spring and winter, make up the majority of acreage of annuals for pasture and silage or hay.

Annuals for silage or hay production is a recognized source of forage throughout the province. Barley silage is the preferred annual in most feedlots and dairy operations outside the traditional corn growing areas. Oats, although higher yielding than barley in most areas, is lacking in feed value and is generally utilized by cow-calf operators who do not require a high quality feed to maintain a cow herd. There is some interest in the use of spring triticale as a silage, but the lack of a "close" seed source, quality, and the maturity of the silage, limits the use of this crop. Field crops branch has been involved in yield and quality trials of barley, oats and triticale, alone and in mixtures at different ratios at Lac La Biche with the district agriculturist and with the Alberta Environmental Centre.

In the southern portion of the province where there are sufficient heat units, corn is still the silage crop of choice. The quality and tonnage that can be obtained is superior to cereals, although the cost of production is much higher. Under good management, the cost per ton of corn silage is still lower than cereal silages due to the higher yields which can be obtained. In some cases, the soft wheats and barleys are being utilized to decrease the capital and input costs, as well as to enable producers to work silage crops into a rotation. Some producers outside the traditional corn growing areas are still trying to grow corn for silage, with very little success.

Field peas utilized as silage have potential as a high protein forage, which is of special interest to dairy producers and cattlemen who background calves. As new varieties become available we realize that we need more information as to their yields and suitability as a silage. Large seed sizes of some of the varieties

increase the input costs to the producers and are therefore avoided.



Field Crops Branch has been involved in two on-farm demos with the district agriculturists to evaluate the use of field peas as a silage crop. The success of these trials was limited due to circumstances beyond our control. A plan to approach the feed evaluation unit is being worked out to test the possible feed value of field peas.

The use of annuals as a spring, summer or fall pasture to supplement perennial pastures, as well as add some flexibility to the livestock operations, is a well utilized practice in most areas

of the province. The annuals of choice are the winter cereals - winter wheat, fall rye, and where available winter triticale. All three crops have their strong and weak points and their usage is determined by the situation.

Intercropping of a winter cereal underseeded to a spring cereal and grazed throughout the summer, or harvested as a silage and then fall grazed, has been shown to be very effective in plots at Lacombe and in limited use by a few producers in the central portion of the province.

Field Crops Branch was involved in a Farming For the Future on-farm demonstration through the Grey Wooded Forage Association and in conjunction with Agriculture Canada at Lacombe to determine the feasibility of grazing a silage/pasture intercrop system in 1989.

Producers are interested in utilizing the flexibility of winter cereals for pasture by underseeding them to perennial forages, grazing the winter cereal covercrop, and allowing the perennials to establish underneath. This is an area for future trials.

Funding to establish a perennial forage variety testing program throughout the province (except the Peace River block), was granted in 1989. Sites, cooperators and seed supplies were put together for the first planting to take place in 1990. The site locations will be:

- Irrigation - Brooks & Bow Island
- Area 1 - Bow Island & Oyen
- Area 2 - Standard & Provost
- Area 3 - Olds & Vegreville
- Area 4 - Lac La Biche & Westlock

Cooperators for these sites will be Alberta Special Crops & Horticultural Research Centre - Brooks; Chinook Applied Research Association - Oyen; Alberta Environmental Centre - Vegreville; and the Crop Protection Branch - Olds.

Variety recommendations will be made from these plots in 1993 when we have data from two sites/area and three harvest years.

The forage agronomist was involved in several on-farm demonstrations, tours, and extension meetings in 1989 involving the use of annuals and perennials for pasture and silage/hay.

e) Range Management

Two fact sheets were prepared; 1) Range and Pasture Management when Dealing with Drought, Agdex 130-14-1, May, 1989; and 2) Poisonous Plants on Range and Pasture, Agdex 130/666-1, January, 1990.

A forage update with Field Services and Special Areas was held near Coronation. Range site, stocking rates and range condition were demonstrated.

The Bullpound Grazing Trial near Hanna was discontinued in the third year of operation. The interesting fact gained, during this exercise, was that crested wheat pasture did not maintain the same animal weight gains as native range pasture during the drought conditions. The trial also demonstrated that the animal unit month calculation should be adjusted for larger cows on community



pastures. The cows on the grazing trial averaged 1,294 lb. in 1987; 1,260 lb. in 1988; and 1,296 lb. in 1989.

The antelope creek habitat development area near Brooks shows an improvement in range condition with the surrounding area. The demonstration of crested wheatgrass deferring grazing in the spring is working well. If the irrigation pivot can be kept running properly this summer, the ranch will make a good demonstration in the County of Newell.

f. Special Crops

During 1989, assistance was provided for the promotion of several programs directed at the Alberta special crop growers. This assistance was extended toward promoting and planning soil and water conservation programs under the terms of reference for CASCI. The branch continued to contribute input and guidance into Alberta Pulse Growers Commission (APGC) demonstration and applied research plots. Both of these areas provide valuable data, as well as use as an excellent extension tool for district and regional staff.

Assistance continued towards APGC endeavors to encourage Foreign Cultivar Screening and minor use herbicide and fungicide research initiatives.

Market prices for special crops remained on the up-side during the year. Strong prices helped to maintain existing acres and a small expansion of some crop kinds such as dry bean, field pea, mustard and safflower.

Increased awareness for value added processing and usage in the province for special crops was evident during the year. Livestock producers increased their interest and usage of field pea and fababean as a replacement for soymeal. Confection sunflower processing for human consumption has gained tremendous ground during 1989. Processing of safflower for bird food increased in 1989, as did processing of lentil, dry bean and field pea for human consumption.



Diversification in crop production in Alberta is now recognized by more producers. Conservation, sustainability and production of home grown feed is assisting toward this awareness. Production for a cash crop is not the only reason for growing special crops; these other aspects compliment diversification initiatives.

g. Seed Technology

Pedigreed seed production continued to increase in Alberta. With the introduction of more private varieties as well as the increase in contract production opportunities, inspected acres achieved an all-time high.

The Alberta branch of the Canadian Seed Growers Association had a very prosperous year. Their membership experienced increased to 1,083 members from 1,068 in 1988 and inspected acres increased by 21,000 to 250,929. They hosted the provincial launching of the C.S.G.A. video Planting for Profit and were active in representing the growers on issues which were pertinent to the industry.

SeCan currently has a membership of 2,578; 621 of which are from Alberta. SeCan is actively promoting 76 of its 221 varieties. These varieties make up 69% of the inspected acres. Membership sales for 1989 were \$89,000,000 and the various plant breeding institutes received \$349,100 in royalties during this year.

Agriculture Canada provided the branch with the opportunity to participate in various activities throughout the year. Some of which were the Seed Division update for inspectors, training sessions for casual and full-time inspectors, authorized establishment training and export seminars.

The Alberta Alfalfa Seed Producers Association have taken on a slightly different format. The association now has a northern branch and a southern branch. Each branch has a board of directors who are actively participating in activities that are relevant to the respective regions and each branch provides two members from their board who provide the makeup for the association. The association deals with issues which are of importance to the industry from a provincial perspective.

The Alberta Forage Seed Council experienced a very productive year. Major areas of activity involved registration for minor use herbicides, revisions to the forage industry handbook, representation at the U.S. conferences in conjunction with the B.C. Fine Seeds Committee, as well as forage seed marketing seminars. The Council is entering 1990 with a new two year mandate with a thrust in exploring the feasibility of developing a forage seed commission.

The Canadian Forage Seed Project is still experiencing good interest in spite of the low prices. Inventories for most species are starting to strengthen after the extensive requests for foundation seed in the late 80's. The branch handled requests for 9,040 kg. of seed.

The four provincial seed shows, Ag-Expo in Lethbridge, Calgary Seed Fair and Hay Show, Peace Classic in Grande Prairie, and the Northlands Pedigreed Seed Show in Edmonton, continue to receive good support. These shows are starting to receive more entries from out of province which is very rewarding. Alberta producers continued to represent our industry well at the Toronto Royal and Agribition. Congratulations and thanks goes out to everyone who continues to make these events successful.

Seed and Grain Technology Program at Olds College - Olds College has renewed their commitment to provide training to the seed and grain industry. Jennifer O'Halloran, formerly from the B.C. Minister of Agriculture, has been hired to carry out the development of the program.

An Industry Advisory Board has been formed from the seed and grain industry, as well as representation from the provincial Colleges and the University of Alberta. The Advisory Board, in their mandate statement, identified the framework by which the training needs or skills required by the industry could be developed. The intent is to standardize a program for across Canada.

The development and delivery of course or components of the two year diploma program have been targeted for the fall of 1990. In addition to the two year diploma program, there will be various short courses provided for the respective industries.

CROP RESEARCH SECTION

The 1989 year was a year of hail and frost. Lacombe, Trochu and Vermilion were damaged by hail that caused the breeding programs to take significant measures to recover from the losses by sending advanced lines to California for selection, only to have a major frost in California that caused 60 to 70 percent sterility in the crop. This rash of bad weather has caused the barley program to

have a significant back up of over 200 populations that will have to be shelved due to the lack of time and facilities necessary to carry a double load through the breeding system.

The number of registered varieties developed from the program is now five barleys and one spring triticale. A new winter triticale variety has received support for registration in time for release in the fall of 1990. Royalties and seed sales of these varieties has reached \$124,836.87. Another \$177,925.52 was received from the sale of by-products for a total revenue to date of \$302,762.39.

a. Spring Barley Program

The spring barley program has continued to follow its original mandate - the production of high yielding feed type 2- and 6-rowed cultivars of both the hulled and hulless type. Special emphasis is being placed on transferring the semi-dwarf characteristic into the 2-rowed barley germplasm base. During 1989 six 2-rowed, six hulless, and six 6-rowed lines were evaluated in the cooperative registration trials.

This year the 2-rowed hulless barley "Condor" was released to producers. Unfortunately hail in the Lacombe and Three Hills area destroyed a large percentage of the potential seed production. The producers of Condor have formed a loose producer association with the aim of coordinating the market development of hulless barleys. The Canadian Wheat Board is also working on market development and are contracting 10 carloads for market development in 1990. Hulless barleys such as Condor may have additional value in the human food markets, however, seeding rates, harvesting methodology, and resistance to weathering are areas in which further study is required at both the research and production level.



b. Spring Triticale Program

Dry conditions in 1989 resulted in reduced yields at the brown soil locations, however the drought resistance of the spring triticales were clearly demonstrated.

The emphasis in the spring triticale program has not changed greatly over the past few years. A major effort is being placed on incorporating early maturity and sprouting resistance into an improved version of the variety Wapiti. Also, the type of spring triticale currently in the program is being changed from a typically awned or conventional spring triticale to the awnless type. The reason for this change is that the awnless characteristic may be of value if the forage production is to include "greenfeed".

At the present time approximately 90% of the new segregating populations are of the awnless/awnletted type, the source of the awnless characteristic coming from the sprouting resistant CWRS

line RL4137. These crosses also involve several sources of sprouting resistance and the variety Wapiti. No crosses were produced in 1989 so that a proper evaluation of current materials could be carried out without overloading the testing system.



Four advanced triticale lines with good seed type and maturity 5-7 days earlier than Wapiti are currently in the cooperative testing system for 1990.

c. Winter Cereal Program

The primary concern in the winter wheat and triticale breeding programs has been the identification of lines with good levels of winter hardiness and improved agronomic performance compared to the tall stature check cultivars.

In the winter triticale program the identification of the winter hardy line 81DE01015 (Pika) has greatly enhanced the efforts of the breeding program. 81DE01015 was accepted for registration based on its improved winter hardiness, snowmold resistance, yield potential, test weight, and protein content relative to the check

cultivar Wintri. Its snowmold resistance is also superior to the levels found in the current cultivars of wheat and fall rye.

A study currently being carried out with Agriculture Canada has indicated that winter triticale demonstrates excellent potential as a spring seeded forage crop for intensive livestock grazing. Tests carried out on 81DE01015 indicate that it has potential for higher levels of forage yield than the currently available cultivars. Consequently forage evaluation of advanced lines in the breeding program will remain as a major screening tool.

In the winter wheat program the development of a shorter stature or lodging resistant plant type has been a primary emphasis. To date a large number of agronomically improved types are being tested for winter hardiness. Maintaining the appropriate kernel shape for the red winter will be a serious problem. However, some interest is being shown by the Canadian Grain Commission in short stature white seeded types with improved levels of winter hardiness.

d. Agronomy Research

The purpose of the agronomy program is two-fold; first, as a physiology program it looks for traits and techniques that can be used in the breeding programs; the drought projects are an example. By assessing affects of drought over the growing season it is hoped that we will be able to determine the period when drought is most critical to yield and assess characteristics that may make some cultivars more tolerant than others. Second, as an agronomy program, it looks at management practices that can be recommended to producers in order to improve yield and crop quality; the triticale silage projects are an example. We are working with both winter and spring types of triticales to find the best mixtures for silage production to maximize yield and feed value.

The long-term rotations at Lacombe were expanded from 18 to 37. The first 18 were in their second year after breaking from four years of alfalfa while an additional 11 were established following

alfalfa and summerfallow. These rotations offer a large scale testing of production practices and cultivars in cropping systems. We will be gathering long term crop and soil data under these different cropping patterns. It is also our desire to keep cost return records for the management of these different cropping systems.

Work is continuing in the areas of intensive crop management with projects in cooperation with Doug Penney of the Soils Branch and Dr. L. Piening of Agriculture Canada. More detailed information on these trials are available in the annual report of the Research Section.

A more detailed annual report on the Cereal and Oilseed Variety Testing program and the Cereal Research program is available from the Agriculture Library in the J.G. O'Donoghue Building in Edmonton and the Field Crops Branch Library in Lacombe. Annual reports for the breeding and agronomy projects are also available at these libraries.

SOILS BRANCH

Summary

Field and laboratory applied research, technology transfer and soil, crop and feed diagnostic services continued to be provided to a wide range of clients including producers, agri-business, research agencies and department staff. Increased emphasis was placed on developing greater efficiencies in the use of crop production techniques on normal and problem soils. These activities were funded by both branch and external funding such as Farming For The Future, Western Grains Research Foundation and the fertilizer industry.

John Brown was appointed Technologist in the Soil Improvement Section. Joan Seath was promoted to Office Manager.

BRANCH ACTIVITIES

1. ADMINISTRATION SECTION

a. Agricultural Lime Freight Assistance (ALFA) Program

Since 1981, the program has provided financial assistance for the transportation of agricultural lime and marl to neutralize farm lands which are acid (below pH 6.0). The program provides 80% of the transportation costs above \$5.50 per tonne for agricultural lime and 50% of the cost of freight for marl plus a product incentive of \$3.00 per cubic metre. The maximum grant per applicant in any one fiscal year is \$8,000. Unfortunately due to a depressed crops market, there were no new developments of marl sources during the year. Grants this fiscal year amounted to \$99,131 for the transport of 3,928 tonnes of lime and marl. This represents a 23% decrease from last year. A summary of the program is shown in Table XIX.

TABLE XIX
AGRICULTURAL LIME FREIGHT ASSISTANCE PROGRAM - SUMMARY

	<u>1981/82</u>	<u>1982/83</u>	<u>1983/84</u>	<u>1984/85</u>	<u>1985/86</u>	<u>1986/87</u>	<u>1987/88</u>	<u>1988/89</u>	<u>1989/90</u>
No. of applicants	62	96	149	81	87	69	39	31	28
Total grant (\$)	150,994	349,363	645,359	302,743	335,039	315,164	110,017	128,058	99,131
No. of tonnes	4,514	11,289	21,487	11,493	12,275	11,606	4,624	5,216	3,928
Average grant per tonne (\$)	33	31	30	26	27	27	24	25	25
Average grant per applicant (\$)	2,435	3,797	4,331	3,738	3,851	4,568	2,821	4,131	3,540

b. Alberta Farm Fertilizer Price Protection Plan

The plan, introduced in 1985, continued to provide grants to farmers using fertilizer for crop production on land farmed in Alberta. Grant payments continued at \$50 per tonne of nitrogen and \$25 per tonne of phosphate. A summary of the program is provided in Table XX.

Caution should be exercised when comparing the fertilizer purchase figures under this plan with the fertilizer sales statistics in Alberta found elsewhere in this report. The fertilizer purchases shown are based on farmer receipts received during a fiscal year (April 1 to March 31). Fertilizer sales figures are for the period July 1 to June 30. Until this year, purchases made under the plan in previous years were eligible for payment in the year they were received by program administration. In addition, the plan allowed for purchases made after August 1, 1984 prior to the announcement on April 1, 1985.

The program has been administered by Central Program Support since October, 1988.

TABLE XX
ALBERTA FARM FERTILIZER PRICE PROTECTION PLAN - SUMMARY

<u>Year</u>	<u>Grant Assistance</u> \$	<u>Fertilizer Purchases</u> tonnes	<u>Applications</u> <u>Paid</u>	<u>Average</u> <u>Payment</u> \$
1985-86	\$21,231,853	942,865	31,161	677
1986-87	17,601,088	788,495	28,385	620
1987-88	17,415,172	791,415	27,473	634
1988-89	18,867,499	871,744	29,998	629
1989-90	<u>18,116,022</u>	<u>824,976</u>	<u>28,634</u>	<u>633</u>
Total/Average	93,231,634	4,219,495	145,851	639

2. SOIL AGRONOMY SECTION

This section was reorganized and renamed the Soil Agronomy Section. The main role of the section has been to develop and implement technology transfer and applied research programs designed to define the fertility status of Alberta soils and provide recommendations for economically optimum crop production. While this remains an essential role, increased emphasis has been placed on developing and evaluating cropping and soil management systems that ensure sustained productivity. A more multidisciplinary approach is being developed to evaluate production practices and address environmental concerns.

a. Production Problems (1989)

Weather factors such as drought, hail and frost had a major influence on crop yields each year. In 1989 however, there were numerous reports of unusually low crop yields in areas where weather conditions appeared to be suitable for average or above average yields. Typically the harvest index was low (grain: straw ratio). Very low yields of canola in central Alberta were often attributed to sulphur deficiency although in most cases a definitive diagnosis was not made. The disappointing yields encountered heightened producer interest in methods of avoiding, diagnosing and correcting crop production problems. An interdisciplinary meeting of government, industry and university agronomists was convened to review the production problems encountered by field staff. The meeting highlighted the lack of threshold or critical levels for determining yield losses from diseases, nutrient deficiencies, weeds, insects and weather factors. The need for integrated agronomic research to evaluate cropping systems and develop better diagnostic criteria was reinforced.

b. Extension

The main extension demand continued to be in the areas of efficient and effective use of fertilizers. Producers continue to seek improved production efficiency through balanced crop nutrition and optimum fertilizer placement. Branch staff were asked by extension staff and agri-business to participate in numerous producer meetings. In-service training courses were also provided to department staff and fertilizer dealers. The factsheets "Alberta Fertilizer Guide", and "Irrigated Crop Recommendations for Alberta" were revised and a new publication "Copper Deficiency of Cereal Crops", was prepared.

c. Field Research Projects

Research experiments are conducted in various soil-climate areas in southern, central and northern Alberta. Research is conducted to: i) identify nutrient deficiencies, calibrate and improve soil tests and develop fertilizer recommendation models for economically optimized production; ii) evaluate new fertilizer technology (efficiency and environmental impact); iii) determine the productivity and sustainability of cropping systems; and iv) study interactions among crop nutrients, diseases, herbicides and other agronomic factors. The following is a brief description of research projects and their current status.

1. Southern and South Central Alberta

Soil Test Calibration - Irrigation - Field research was completed in 1987. The final report titled "Development of Fertilizer Recommendations For Irrigated Grain and Oilseed Crops" was published. The report summarizes results gathered from 1982 to 1987. The work was supported by two Farming for the Future projects #83-0028 and #87-003. Crop response to soil and fertilizer nitrogen was evaluated and individual regression equations were fitted for each crop site and final

model coefficients for each crop were prepared for both optimum and average production conditions. Crops studied included: hard red spring wheat, durum wheat, soft white spring wheat, HY-wheats, 2 row and 6 row barley, flax, canola, sunflowers, peas, beans, grain and silage corn.

All information has been provided to all public and private soil testing laboratories in western Canada as well as Alberta Agriculture extension staff in southern Alberta.

To make the information useable for irrigation farmers, a computer program titled "Fert-90" was developed specifically for use by district agriculturists to aid farmers in determination of economic fertilizer requirements. The program will be tested and evaluated in 1990 by district agriculturists. If the program is deemed successful, the program could be made available to fertilizer dealers and farmers.

Soil Test Calibration - Dryland - The project initiated in 1988 with a Farming for The Future grant (88-0267), was expanded from 12 research locations to 16 locations in 1989. Fertilizer experiments were conducted with 3 or 4 common crops grown on fallow and stubble in the various agroecological areas of southern and south central Alberta. One more year of field results will be required before preliminary data analysis and initial development of fertilizer response models can begin.

Intensive Crop Management - The third year of this Farming for the Future funded project (#87-0163) was completed. Experiments were initiated in 1987 at Lethbridge and Vauxhall. Each site has Katepwa and Fielder wheat, Harrington and Samson barley, and Global and Westar canola. Treatments include fertilizer rates and types, seeding rates, fungicides and plant growth regulators (13 treatments and 4 replicates).

The interaction of higher seeding rates and fertilizer rates generally increased yields by 10-20% over conventional seeding and fertilizing rates. However, yield increases are not always consistent, particularly when fungicides and growth regulators are added. Continued study is required to identify and sort out various interaction effects.

Of significant importance was the achievement of 203.0 bu/ac of Harrington barley at the Vauxhall site. Other best yields in 1989 were: Westar canola - 80.6 bu/ac; Fielder soft wheat - 115.1 bu/ac; Katepwa hard wheat - 106.1 bu/ac; Samson barley - 186.8 bu/ac.

Fertilizer Placement - Research plots were initiated at Foremost, Lethbridge, Claresholm and Three Hills to investigate various timing, rates and placement methods of nitrogen fertilizers. Three rates each of deep banded, broadcast-incorporated and spoke wheel injected nitrogen were pre-plant applied. These were compared to various rates of in-crop broadcast and spoke-wheel injected nitrogen and various combinations of pre and post-seeded applications.

The major problem encountered with this project was the technical and engineering problems with the spoke wheel injector. Because of uncertainty of accurate application rates all plots with pre-plant applied N spoke wheel injected had to be abandoned. After modification of wheel hubs, changing to an electric pump and adding a graduated cylinder for calibration, most application problems were eliminated.

Phosphorus Cycling and Soil Testing - A project studying phosphorus cycling in chernozemic and luvisolic soils has been conducted for the past three years, with funding coming from the Western Grains Research Foundation for the past 2 years. This year the focus has been to evaluate a number of phosphorus soil tests to determine the ability of each to

predict crop response to added P fertilizer. Ken Perl, a soils instructor from the Lethbridge Community College, was seconded to work with the Soils Branch on this project. Sixty-three soils were gathered from across Alberta for use in a greenhouse study. Wheat and canola, each with 3 phosphorus treatments, were grown in each soil. The trials were nearing completion at the end of the fiscal year and data analysis, and report will be completed in 1990-91.

2. Central and Northern Alberta

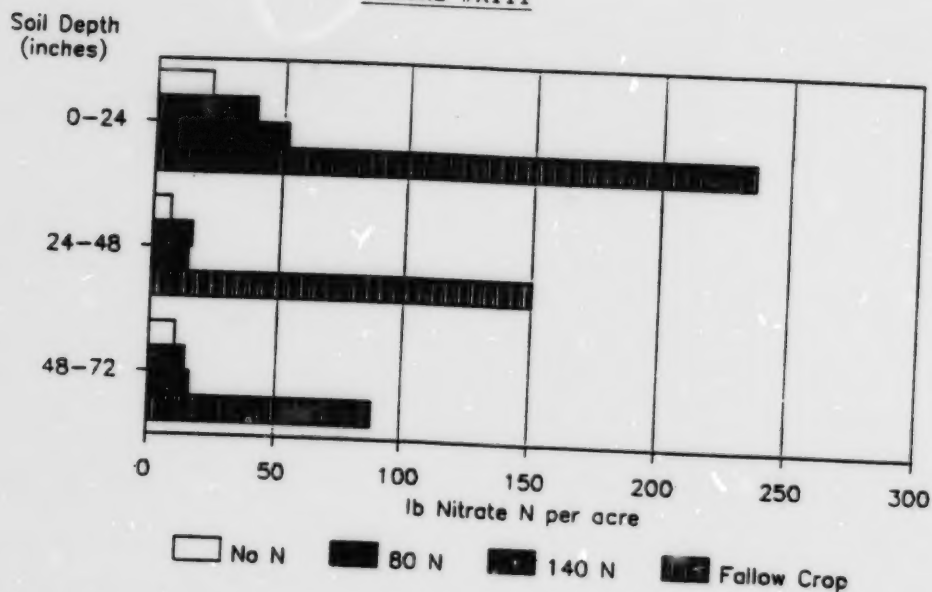
Soil Test Calibration and Maximum Economic Yield - The third year of this project was completed. The main objectives were to i) determine optimum rates of nitrogen and phosphorus and their interaction for current varieties of barley and ii) determine the effects of chloride, fungicide, plant growth regulator and post-seeding application of nitrogen on yield and quality of barley. The information obtained from the study was used in extension and soil test recommendation programs.

Intensive Crop Management - The third year of this Farming For The Future (FFF) funded project was completed. Two varieties of barley, wheat and canola were grown in a continuous crop rotation system. Each variety was grown at two levels of fertility and two plant populations with fungicide and plant growth regulator treatments. Three years results of this study were summarized in a paper presented at the March 1990 FFF Conference.

In addition to evaluating the effects of various inputs on crop yield and quality, the environmental issue of nitrate leaching into groundwater was assessed. The nitrate levels in soil samples taken to a depth of six feet on the ICM site at

Calmar and an adjacent area managed in a crop fallow rotation indicate a much greater potential for nitrate leaching from crop-fallow rotations than from the nitrogen fertilizer treatments (Figure #XIII).

FIGURE #XIII

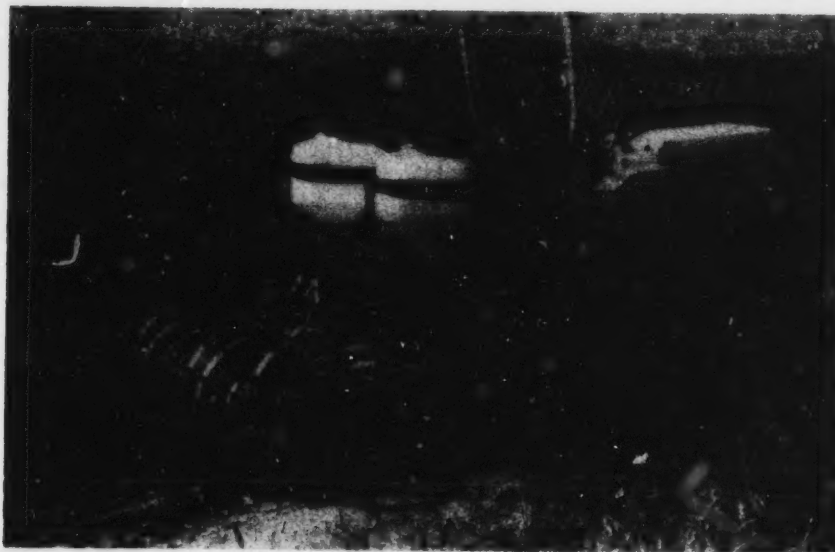


The effect of fertilizer and soil management on the potential of nitrate leaching (Calmar site, sampled fall 1989).

Fertilizer Application Technology and Sources - High pressure and spoke wheel equipment is being developed for injection of liquid fertilizers into established crops. Field experiments were carried out with barley (two locations) and grass forage (in cooperation with CDA, Lacombe) to evaluate this new technology and other methods of post-seeding fertilizer application for improving fertilizer efficiency, and increasing protein. Further equipment development and several years of testing will be required to fully evaluate the technology.

Liquid acid-phosphate fertilizer was compared to granular ammonium phosphate at two locations. Acid fertilizer are being actively marketed in several areas of the province.

Their efficiency relative to conventional fertilizers has not yet been established. Funding for this research is received from industry through Alberta Agricultural Research Institute.



Diagnosis and Correction of Copper Deficiency - Three field experiments started in 1987 to determine the extent of copper deficient soils and develop reliable diagnosis criteria were continued and an experiment to study interactions between Cu, P and S was added. Fourteen field scale strip trials were also established to provide additional information on the extent of Cu deficiency and develop diagnosis criteria. Soil samples, whole plant and newest leaf samples were taken in transects to determine spatial variability and develop critical Cu levels for soils and plant tissue.

Prior to 1987, research on copper deficiency was very limited. Considerably more work is required to accurately determine the extent of deficiencies and to develop reliable diagnostic criteria. Soil types prone to copper deficiency occupy at

least 1 to 2 million acres. However, the acreage actually affected and the amount of yield loss can't yet be estimated. Copper deficiency cannot be accurately determined on the basis of soil or tissue tests alone. Research and observations have indicated that several other factors such as soil texture, organic matter, manure applications, diseases and probably some herbicide can interact to influence copper deficiency.

Where copper deficiency has been identified, applications of copper fertilizer has given a high economic return. A single application of copper can correct a deficiency for several years.

Fertilizer Sales and Price Trends - Continued concern with low crop prices and rising input costs has resulted in only a moderate increase in fertilizer use and increased emphasis on efficiency. Fertilizer sales in Alberta increased to 952,046 tonnes in 1988-89 from 886,834 tonnes in 1987-88 (Table XXI). However they did not exceed the peak of 968,442 tonnes in 1984-85.

TABLE XXI
FERTILIZER SALES IN ALBERTA¹
(By Analysis and Nutrient Content)
July 1 - June 30
(Metric Tonnes)

Fertilizer	1985-86	1986-87	1987-88	1988-89
82-0-0 (Anhy. Amm.)	157,998	131,260	152,684	163,158
46-0-0 (Urea)	222,947	222,206	237,587	285,373
34-0-0 (Amm. NO ₃)	71,210	66,442	73,371	76,287
21-0-0 (Amm. SC ₃)	21,885	22,883	42,661	56,697
28-0-0 (N. Soln.)	20,651	46,279	42,137	30,728
Other N	26,398	20,823	9,884	2,885
Mon-amm. Phosphate	273,370	244,822	249,260	284,348
18-46-0	74	67	--	--
16-20-0	27,114	21,292	16,386	7,512
Other	13,405	22,390	21,334	6,826
10-34-0 (Soln.)	1,735	--	--	--
0-0-60 (KCl)	34,572	35,140	39,259	38,004
Others	2,235	2,251	2,271	228
Elemental S	1,027	--	--	--
TOTAL	874,621	835,856	886,834	952,046
Nitrogen (N)	308,908	289,186	315,756	346,536
Phosphorus (P ₂ O ₅)	154,000	140,197	137,369	148,954
Potassium (K ₂ O)	21,357	21,729	24,328	23,194
Sulphur (S)	--	14,181	19,101	16,097
Ag. Lime ²	11,853	8,388	4,817	4,094

¹Source: Canadian Fertilizer Institute, Ottawa

²Source: Alberta Agriculture, Edmonton

Fertilizer prices have remained fairly stable over the past year (Table XXII). The price of phosphate (11-51-0) has tended to increase slightly while nitrogen has remained constant or declined as is the case with anhydrous ammonia (82-0-0).

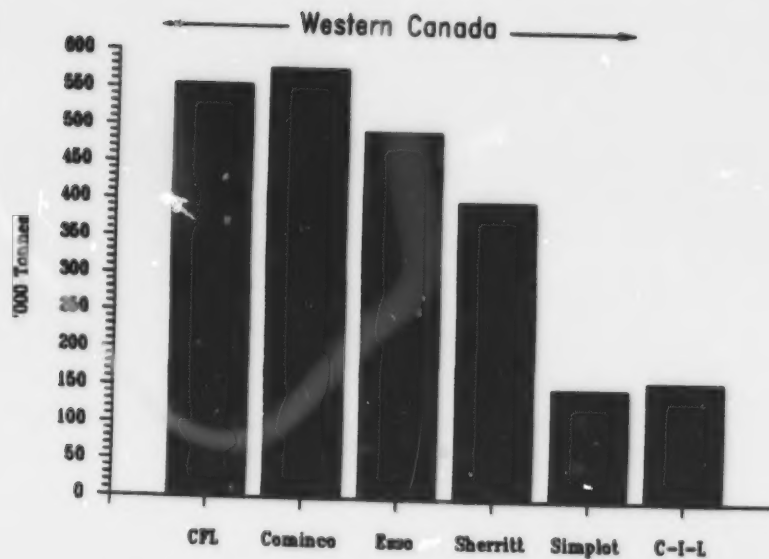
TABLE XXII
AVERAGE PRICE OF SELECTED FERTILIZERS IN APRIL

<u>Fertilizer</u>	<u>Year</u>			
	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>
	-----\$ per tonne-----			
Ammonium Phosphate (11-51-0)	\$341.	\$345.	\$379.	\$351.
Urea (46-0-0)	232.	225.	257.	231.
Anhydrous Ammonia (82-0-0)	425.	373.	390.	348.

The ratio of nitrogen to phosphorus use increased from about 1:1 in the late 1960's to 2.3:1 in 1985 and has remained relatively constant since. Urea and anhydrous ammonia continue to be the main nitrogen sources with urea showing the largest increase in use. Sales of ammonia sulphate increased substantially in both 1988 and 1989.

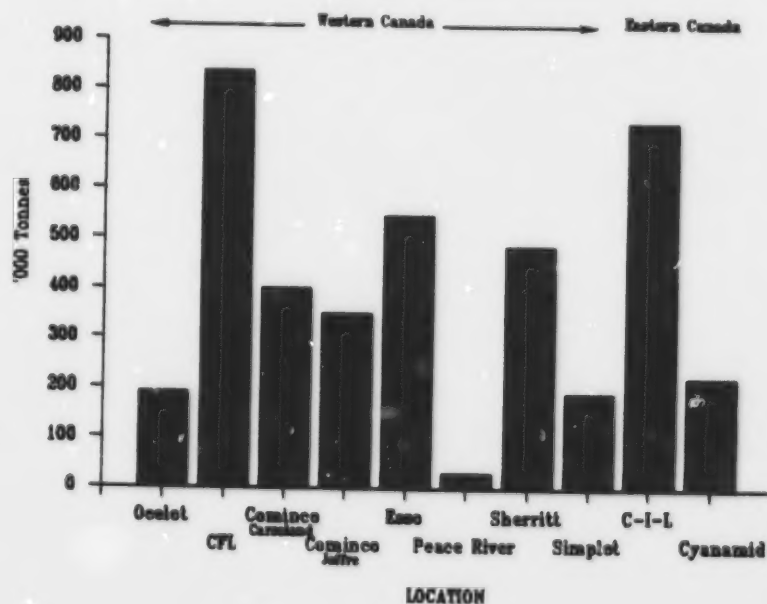
Alberta has the largest capacity for the production of nitrogen and phosphate fertilizers in Canada (Figures XIV, XV, XVI and XVII). Except for Simplot located at Brandon, Manitoba and Cominco's phosphate and ammonium sulphate production at Trail, B.C., all of the production capacity in western Canada is located in Alberta. About 50% of the nitrogen fertilizer produced is exported.

FIGURE #XIV



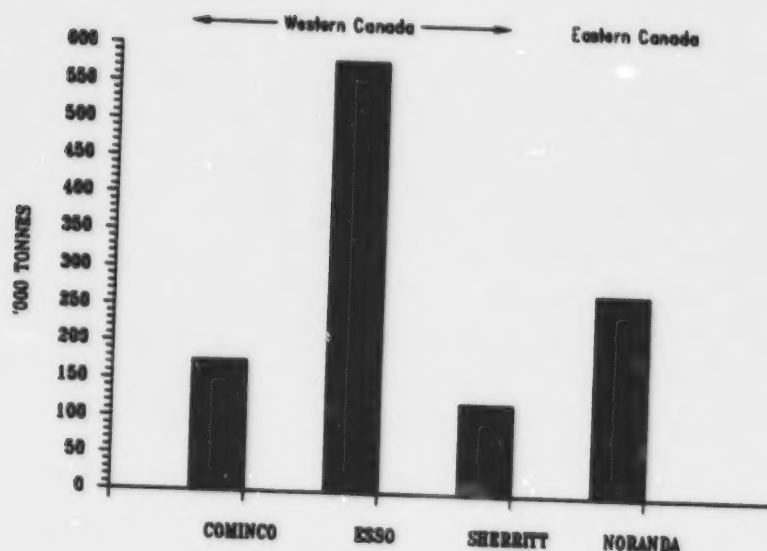
Urea Production Per Annum. Source: Canadian Fertilizer Institute, Ottawa, 1989.

FIGURE #XV



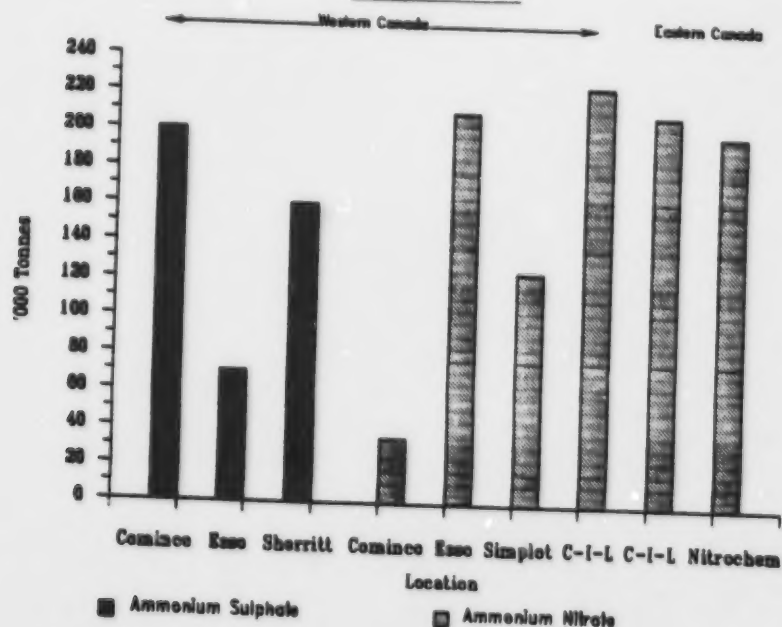
Ammonia Production Per Annum.

FIGURE #XVI



Ammonium Phosphate Production Per Annum.
Source: Canadian Fertilizer Institute, Ottawa. 1989.

FIGURE #XVII



Production of Ammonium Sulphate and Nitrate Per Annum. Source: Canadian Fertilizer Institute, Ottawa, 1989.

3. SOIL IMPROVEMENT SECTION

Research and extension programs relating to the improvement of solonetzic, luvisolic, organic and acid soils were the main activities of staff in this section. Research trials were established and maintained in cooperation with farmers, producer organizations, district agriculturists and agricultural service boards throughout central Alberta. Extension activities included participation in farm meetings and plot tours; preparation of reports and factsheets; and in-service training for district agriculturists, agricultural fieldmen and staff of various producer organizations.

The soil improvement programs were reviewed as part of a departmental review of all soil and water programs. Need for the program, resources expended and output were determined for each program area; strengths and weaknesses were identified for each program.

a. Solonetzic Soils

A committee representing industry and various departments and agencies of government was established to develop a research proposal to identify the agronomic and environmental concerns of using phosphogypsum as a soil amendment. Nine meetings were convened to develop a proposal. The proposal will be finalized after input is received from environmental organizations and then will form the basis for a field research program. The presence of small quantities of radionuclides and heavy metals in phosphogypsum may limit the potential use of this material as a soil amendment. Phosphogypsum is a by-product from the production of phosphate fertilizer; approximately 40 million tonnes are stockpiled at fertilizer plants near Medicine Hat, Calgary, Fort Saskatchewan and Redwater.

Crop response to deep plowing, ripping and the application of lime and phosphogypsum was determined at 32 locations. Crop response (Table XXIII) to deep tillage (deep plowing and ripping) is smaller than in previous years; in the brown soil zone drought reduced the yield potential while in the higher precipitation areas such as the black soil zone timely precipitation allowed for more normal crop development.

TABLE XXIII
WHEAT RESPONSE (BU/AC) TO DEEP PLOWING AND RIPPING BY SOIL ZONE

<u>Soil Zone</u>	<u>Deep Plowed</u>	<u>Ripped</u>
Brown	4.6 (3)*	2.1 (2)
Dark Brown	6.8 (1)	7.2 (3)
Black	--	1.0 (4)

() * number of sites

b. Luvisolic Soils

Four trials were monitored in 1989 to evaluate crop response to deep ripping of luvisolic soils. Yield increases of 1.4, 19.8, 4.8 and -1.3 bu/ac have been obtained to date for wheat, oats, barley and canola respectively. A small yield increase of 0.1 tonne per acre has been obtained with perennial forage.

In one study soil samples were obtained from check and deep ripped treatments to determine the effect of deep ripping on root distribution through the soil profile. Data from root washing in these samples showed total root length in the 15 to 30 and 30 to 45 cm depths was increased by 19 and 37 percent respectively.

c. Organic Soils

One field scale strip trial and one small plot replicated trial were monitored in 1989 to assess the feasibility of deep plowing organic soils. Marginal increases in crop yield suggest deep plowing may not be economically feasible in deep (greater than 60 cm) organic soils. Deep plowing has however resulted in faster frost recession than occurs in check soils.

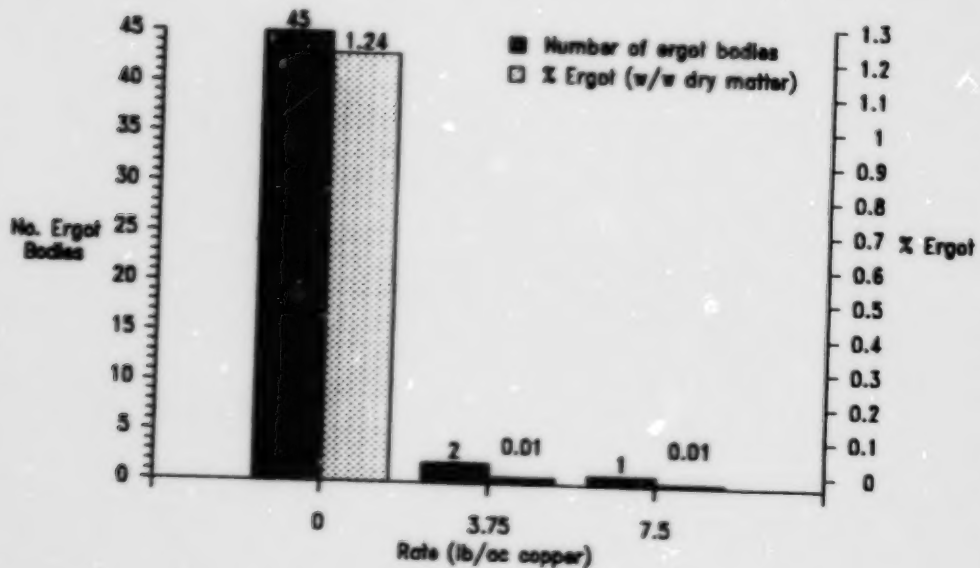


Nine trials were monitored to investigate the nutrient requirements of crops grown on organic soils. Yield of barley was increased by up to 40 bu/ac with applications of up to 60 lb/ac rates of nitrogen and phosphate. Yield increases from 10 to 20 bu/ac were obtained for wheat and barley from the application of soil applied copper. In addition to increased yield, significantly less ergot occurred in treatments receiving copper (Figure #XVIII).

Three sites were monitored to determine seasonal variation in soil test values. Preliminary results indicate that the availability of phosphate, copper and manganese increase during freeze-thaw events in the soil. Guidelines for sampling organic soils will be developed.

The organic soil management program was reviewed. Research and extension priorities were identified through to March 1992 and opportunities for coordination of activities with a producer organization were also identified.

FIGURE #XVIII



d. Acid Soils

Crop response to lime was measured at 3 locations. Preliminary results indicate liming beyond pH 6.5 is not economically sound.

Industrial by-products including materials produced from water treatment plants and from the production of acetylene, heavy crude oil and various hydrocarbon derivatives are being evaluated to determine their suitability as liming materials. Production of these materials exceeds 30,000 tonnes of dry matter annually and could be a valuable resource for the agricultural industry. The close proximity of these materials to the areas of potential use supports the need to continue evaluations.

4. LABORATORY SERVICES SECTION

The Agricultural Soils and Animal Nutrition Laboratory (ASANL) has four major objectives:

1. To identify and develop diagnostic and routine laboratory methodologies in soil, plant and animal feed analyses, as required by crop and animal producers to maintain and improve economic and environmental viability.
2. To transfer results of research and development to producers, directly and through private sector laboratories, agri-business and department extension, and thus ensure the farming public access to the latest technology and recommendations.
3. To provide basic diagnostic and analytical services to private and public research and extension institutions.
4. To participate as an active partner in multidisciplinary applied research.

Staff were involved in the provision of laboratory services, field and laboratory research in soils and crops and in technology transfer. Considerable contact is made with producers, other department staff and with researchers and agronomists at universities, federal research institutions, private sector laboratories and agri-business.

a. Laboratory Services Program

The laboratory provides:

1. Analyses and Recommendation Services to Alberta farmers and other producers for the economic maximization of crop and animal production.
2. Diagnostic Services to Alberta Agriculture staff to enable efficient extension and advisory functions to farmers, greenhouse operators and other producers with special soil, crop and animal problems.
3. Research Analyses Services to public and private agency researchers for projects directed toward the improvement of crop and animal production.

4. Reference Laboratory Services to private sector laboratories for the purposes of cross referencing methodologies, confirming analyses on unusual samples, and quality assurance.

Tables XXIV and XXV show that during this fiscal year the laboratory processed a total of 14,394 soils and 16,866 plant and feed materials samples. These figures represented a 20.9% decrease in soils and a 39.8% increase in plant and feed materials samples from 1988-1989.

TABLE XXIV
FARMER, RESEARCH AND OTHER (DIAGNOSTIC, GARDEN, GREENHOUSE) SOIL SAMPLES RECEIVED AND AS PERCENTAGES OF TOTAL SOIL SAMPLES FOR SPECIFIED PERIODS

<u>Period</u>	<u>Soils</u>			<u>Totals</u>
	<u>Farmer (%)</u>	<u>Research (%)</u>	<u>Other (%)</u>	
1986-87	3,657 (18.9)	9,898 (51.1)	5,798 (30.0)	19,353
1987-88	3,337 (21.8)	7,927 (51.7)	4,061 (26.5)	15,325
1988-89	2,616 (14.4)	11,576 (63.6)	4,005 (22.0)	18,197
1989-90	2,443 (17.0)	7,766 (54.0)	4,185 (29.0)	14,394

TABLE XXV
FARMER, RESEARCH AND DIAGNOSTIC PLANT AND FEED MATERIALS SAMPLES RECEIVED AND AS PERCENTAGES OF TOTAL PLANT AND FEED MATERIALS SAMPLES FOR SPECIFIED PERIODS

<u>Period</u>	<u>Plant and feed materials</u>			<u>Totals</u>
	<u>Farmer (%)</u>	<u>Research (%)</u>	<u>Other (%)</u>	
1986-87	3,359 (24.5)	7,316 (53.4)	3,015 (22.1)	13,690
1987-88	2,524 (19.5)	7,209 (55.8)	3,189 (24.7)	12,922
1988-89	2,175 (18.0)	6,577 (54.5)	3,312 (27.5)	12,064
1989-90	2,016 (12.0)	11,312 (67.0)	3,538 (21.0)	16,866

These differences reflect shifts in the sample types submitted by researchers as plant and feed materials samples greatly outnumbered soils samples this year.

Comparison of the 1989-90 data with the three previous fiscal years show a continuing decline of farmer submissions of both soils and plant and animal feed samples. Diagnostic sample submissions were more consistent from year to year. During the past three years research sample submissions have shown a consistent increase from 15,136 in 1987-88 (53.6% of total receipts) to 19,078 in 1989-90 (61% of total receipts).

Most farm soil sample submissions were received from October to January and during April and May. Farm plant and feed materials sample submissions peaked during the August to January period.

Tables XXVI and XXVII show respectively the numbers and types of analyses conducted on soils and plant and feed materials samples for the fiscal years 1986-87 to 1989-90.

A regular analysis package for farm and garden soils consist of analyses for nitrogen, phosphorus potassium, sulphur, pH, salinity, texture and free lime. For greenhouse soils a regular package includes analyses for texture, pH, salinity, ammonium, nitrate, nitrites, chloride, sulphur, phosphorus, potassium, sodium, calcium and magnesium.

A regular analysis package for plant and feed materials consists of the following:

- Whole grains - bushel weight, moisture, protein, phosphorus.
- Roughages - moisture, protein, calcium, phosphorus, fibre (ADF), nitrate, pH (silage only).
- Mixed feeds - (processed grains and grain and supplements with less than 25% roughage) moisture, protein, calcium, phosphorus.

The numbers of analyses conducted by the laboratory in 1989-1990 reflect the change in sample type submissions. With a decrease in soil samples there was a corresponding decrease in numbers of analyses. This is counterbalanced by the marked increase in numbers of analyses with the increase in plant and feed materials samples for the same period.

TABLE XXVI
THE NUMBER AND TYPES OF SOIL ANALYSES FOR THE SPECIFIED PERIODS

Analyses	Period			
	1986-87	1987-88	1988-89	1989-90
Regular Package ⁺	19,353	15,325	18,197	14,394
Lime	--	1,762	135	300
Organic Matter	--	2,003	2,918	2,013
Ash	--	537	107	421
Mechanical Analysis	--	378	99	264
Water Absorption	--	--	7	1
Bulk Density	--	187	96	80
Sodium Absorption Ratio (SAR)	--	--	380	213
Exchange Capacity	--	--	171	35
Moisture	--	--	822	188
Total Nitrogen (N)	--	--	341	714
Total Phosphorus (P)	--	--	147	144
Total Sulphur (S)	--	--	1	0
Ammonium (NH ₄)	--	--	6,002	3,851
Calcium (Ca)	--	--	1,321	167
Magnesium (Mg)	--	--	1,322	159
Chloride (Cl)	--	--	253	353
Iron (Fe)	2,326	1,364	3,102	2,358
Manganese (Mn)	2,470	1,336	3,186	2,679
Copper (Cu)	2,298	1,405	5,396	2,859
Zinc (Zn)	2,259	1,329	3,082	2,339
Boron (B)	1,274	1,046	800	355
Molybdenum (Mo)	101	341	402	320
Miscellaneous*	213	325	369	352
Totals	30,294	27,338	46,656	34,559

+ See Text

* Other analyses include occasionally such as aluminum (Al), arsenic (As), carbonate/bicarbonate (CO₃/HCO₃), cobalt (Co), fluoride (F) and lead (Pb).

-- Information unavailable.

TABLE XXVII
THE NUMBER AND TYPES OF PLANT AND FEED MATERIALS ANALYSES
FOR THE SPECIFIED PERIODS

Analyses	Period			
	1986-87	1987-88	1988-89	1989-90
Regular Package ⁺	13,690	12,922	12,064	16,866
Carotene	213	126	56	80
Prussic Acid	18	15	4	23
Salt	54	482	313	183
Crude Fat	211	374	212	621
Ash	155	1,185	592	208
Acid Detergent Insoluble Protein (ADIP)	339	490	676	368
Crude Fibre	--	40	187	55
Neutral Detergent Fibre (NDF)	232	865	635	1967
Lignin	80	799	605	314
Sodium (Na)	224	249	1,275	2,665
Potassium (K)	1,750	1,595	1,764	4,839
Magnesium (Mg)	1,507	681	1,822	4,274
Sulphur (S)	1,617	1,384	1,888	4,985
Selenium (Se)	2,342	1,226	1,564	2,552
Iron (Fe)	869	730	1,685	4,021
Manganese (Mn)	2,230	1,886	2,945	4,781
Copper (Cu)	2,668	1,999	3,011	5,158
Zinc (Zn)	2,582	1,626	2,988	5,015
Boron (B)	556	929	1,322	923
Molybdenum (Mo)	453	217	1,506	1,790
Cobalt (Co)	--	--	1,202	1,670
Aluminum (Al)	47	8	1,198	1,868
Miscellaneous*	385	19	71	260
Totals	32,222	29,849	39,585	65,486

+ See text

* Other analyses include arsenic (As), cadmium (Cd) and lead (Pb).

-- Information unavailable.

The replacement of the inductively coupled plasma (ICP) instrument with a new unit greatly enhanced the trace mineral analytical capability of the laboratory. In addition, a major technical time saving was effected by the transfer of sulphur analyses to this equipment.

The use of near infrared reflectance spectroscopy (NIRS) for the analyses of research plant and feed materials samples requiring moisture, protein, phosphorus and copper determinations has enabled the laboratory to maintain a reasonable turn - around time. A total of 5,905 samples were completed by NIRS.

Table XXVIII provides a summary of the 1989-90 research projects analyses program. A total of 44 applications were approved. The laboratory received a total of 22,335 samples from these projects compared to 17,516 samples during 1988-89. Over 75% of samples were from Alberta Agriculture projects.

Research projects covered a wide range of topics which included:

- animal feeds quality and evaluation
- crop irrigation and fertility requirements
- intensive crop management systems
- organic and problem soils management

TABLE XXVIII
SUMMARY - 1989-90 RESEARCH PROJECTS
SAMPLE ANALYSIS PROGRAM

Project Number	Researcher and Project Title	Sample Volume	
		Soils	Plants and Feeds
89-001	Dr. Colin McKenzie. Irrigation management of lentils.	28	32
89-002	Dr. Colin McKenzie. Irrigated alfalfa forage production.	164	59

TABLE XXVIII - (Continued)

Project Number	Researcher and Project Title	Sample Volume	
		Soils	Plants and Feeds
89-003	Dr. Colin McKenzie. Irrigation management of four species of grass grown for seed production.	30	
89-004	Dr. Colin McKenzie. Salinity and cold tolerance of trees.	20	
89-005	Dr. Colin McKenzie. Nitrate movement in soil.	66	
89-006	Dr. Colin McKenzie. Irrigation of safflower.	36	
89-007	Dr. Don Salmon. To develop an NIR evaluation for forage quality in spring triticale.		80
89-008	Sam Jaikaran. Evaluation of the nutritive value of ten varieties of field peas grown in Alberta.		372
89-009	Dr. S. Malhi and Dr. S. Kibite. Comparisons in straw quality among and between cultivars of wheat, barley and oats grown in Central Alberta.		952
89-010	Dr. S. Malhi. Trace element levels of brome grass hay as influenced by nitrogen fertilization		722
89-011	Dr. S. Mahli. Levels of trace elements and some other quality parameters as influenced by nitrogen fertilization of meadow brome grass grown as pasture.		652
89-012	Arvid Aasen. Grazing trial using a spring cereal-white cereal intercrop system.		380
89-013	Dr. G. Mathison. Ruminant feed evaluation unit.		158
89-014	Dr. Ross McKenzie. Development of irrigated and dryland fertilizer recommendations.	702	1,358

TABLE XXVIII - (Continued)

Project Number	Researcher and Project Title	Sample Volume	
		Soils	Plants and Feeds
	Dr. Ross McKenzie and Ken Perl. Soil Test Phosphorus.	1,271	1,205
89-015	Tom Jensen. Annual legume plowdown to replace a cultivated fallow.	1,730	212
89-016	Tom Jensen. Canola and conservation tillage.	40	
89-018	Dr. M. Nyborg. Crop available nitrogen as affected by long term cultural methods and time of soil sampling.	1,097	753
89-019	Belinda Choban. Field vegetable fertility trial.	156	156
89-020	Doug Penney. Soil Test recommendations for maximum economic yields.	206	775
89-021	Doug Penney. Copper fertilizer requirements of deficient mineral soils.	524	2,986
89-022	Doug Penney. Liquid acid phosphorus fertilizers.		180
89-023	Doug Penney. Post seeding application of fertilizer nitrogen.	160	298
89-024	Doug Penney. Intensive management systems for barley, wheat and canola production.	244	830
89-025	Rick Sherstabetoff. Copper and manganese requirements of crops grown on organic soil.	345	289
89-026	Rick Sherstabetoff. Nitrogen and phosphorus requirements of cereal crops grown on organic soils.	12	128
89-027	Rick Sherstabetoff. Potassium fertilization for barley grown on organic soil.	144	97

TABLE XXVIII - (Continued)

Project Number	Researcher and Project Title	Sample Volume	
		Soils	Plants and Feeds
89-028	Rick Sherstabetoff. Phosphorus fertilization for barley grown on organic soil.	144	49
89-029	Rick Sherstabetoff. Organic soil back flooding feasibility study.	15	
89-030	Rick Sherstabetoff. Fertilization of perennial forage grown on organic soil.	140	56
89-031	Rick Sherstabetoff. Effect of liming acidic organic soils on crop growth.	39	
89-032	Rick Sherstabetoff. Characterization of organic soils for the purpose of improving fertility recommendations.	270	
89-033	Rick Sherstabetoff. Organic soil deep tillage feasibility study.	60	82
89-036	Jerome Lickacz. Solonetzic soils deep tillage feasibility study.	95	58
89-037	Jerome Lickacz. Liming acid soils.	368	
89-038	Dr. V. Baron. Potential for mineral deficiencies in forage grasses.		377
89-039	Barry Yaremcio. Unusual feedstuffs evaluation project.		186
89-040	Dan Cole. Conservation fallow. CARTT Project.	432	
89-041	Dr. J.R. King. Rotational vs. Continuous grazing with sheep.		61
89-042	Jim Dawson. Nutrient analyses of prairie native range and tame pasture on selected sites in Alberta.		84
89-043	Murray Green. Reduced tillage demonstration.	66	

TABLE XXVIII - (Continued)

Project Number	Researcher and Project Title	Sample Volume	
		Soils	Plants and Feeds
89-044	Dr. Solomon Kibite. Evaluation of exotic forage oat germplasm lines for use in a forage oat breeding project.		104
TOTALS		8,604	13,731
OVERALL TOTAL		22,335	

b. Research and Technology Transfer Program

Major emphasis has been on designing and implementing an improved Quality Assurance/Quality Control program for the laboratory. Also, implementation of automated data capture and handling has commenced. This will ultimately enable data capture and processing directly from analytical instruments and access to data files from remote locations.

Soil test calibration update and development of yield equations continued. These insure maintained and improved reliability of soil test recommendations.

The final draft of the "Soil Test Recommendations for Alberta: Extension Manual" is being prepared. This manual provides a detailed description of soil sampling and soil test interpretations and recommendations for Alberta.

Visits and consultations with all major provincial private sector laboratories involved in agricultural soils and plant and feed materials analyses resulted in: i) identification of their capabilities and concerns and their expectations of the role of ASANL; ii) establishment of trust; and iii) a closer inter-laboratory working relationship.

ALBERTA TREE NURSERY AND HORTICULTURE CENTRE

Summary

The Centre continued to provide leadership to the horticulture industry and coordinated very effectively with many of its commodity groups. These groups included Alberta Greenhouse Growers Association, Alberta Market Gardeners Association, the Alberta Seed Potato group, Fruit Growers Society of Alberta and several groups within the Landscape Alberta Nursery Trades Association umbrella.

The Centre also cooperated with several government branches, divisions and departments. Cooperative projects were conducted with Crop Protection Branch, Soils Branch, Alberta Special Crops and Horticulture Research Centre, 4-H Branch, Market Development Branch, Alberta Environmental Centre, Alberta Fish and Wildlife, Alberta Forest Services and Alberta Transportation.

Many research and product testing projects were commenced in 1989. These projects were conducted in cooperation with the University of Alberta, Humate of Canada Limited, Can-Green services, Auster Limited, Cub-Resources Limited and both urban and rural public. Some of these groups provided funds for research and product testing.

BRANCH ACTIVITIES

Protected Crop Development

This section is involved in research and development for the greenhouse, small fruit and more recently, tree seedling industry. During this year this section:

- maintained an effective level of technology transfer through individual grower visits, workshops, open houses, courses and newsletters;
- conducted research on the use of potassium as a nutrient for cucumbers and information made available to growers resulting in increased production;
- continued the developmental work on bio-control of root rot caused by Pythium in hydroponic systems;
- taught a course on greenhouse management at the University of Alberta fulfilling a part of our commitment to the betterment of the greenhouse industry;
- continued micropropagation of saskatoons and other plants. Five thousand genetically pure saskatoon plants were provided to the Fruit Growers Society of Alberta.

Nursery Crop Development

This section deals with shelterbelt production and extension, and woody plant research and extension.

- On May 28th, 1989, frost injured growth on ash, walnut and oak. 25% of ash were killed in seed beds. The frost also injured other blossoms.

- Plant orders for 1990 were 30% higher than that of 1989 (1,130,000 in 1990 to 866,000 in 1989). Out of these, 456,000 plants were provided free under the field windbreak program. Northwest poplar, green ash, caragana, dogwood and white spruce were made available for 1990 distribution under the free field windbreak program, acute leaf willow will be added to this list for 1991 distribution. Poor recovery of stooling beds from 1987 frost have caused shortages in northwest and griffin poplars.
- During this year 1,005,325 other plants were distributed including 43,600 seedlings for Arbor Day.
- The Regional Woody Plant Test Program is now in its seventh year. The Prairie Regional Trial for Woody Ornamentals and All-American Selections Annual Flower Trials were initiated. The Austre willow grew 9½ feet by September but was killed to the ground by early frosts.

3. Horticulture Crop Development

The horticulture crop development section deals with research, extension and production for the seed potato and vegetable industries, urban and rural non-commercial horticulture extension and micro-propagation pathology.

- Excellent results were obtained from research programs on Rhizoctonia disease of potatoes, studies of phytotoxins produced by Alternaria spp., and improved micropropagation techniques for seed potatoes.
- Extension programs in vegetable production encouraged people to become vegetable growers and the program further helped them become established in the industry. Research trials were successfully re-established and growers have shown confidence in recommendations generated from the results.

- The Master Gardener Program has been planned and will become effective in 1990. Horticulture extension via telephone inquiries continues to gain credibility and popularity.
- The Alberta seed potato industry is expanding continually and has grown into a 9 million dollar industry. Grower confidence in this program is at an all time high. The recent trend of participation by private enterprises in the production of nuclear and pre-elite seed is proving to be very successful.

A comprehensive description of the Alberta Tree Nursery and Horticulture Centre's research, development and extension activities is available by requesting the 1989 Alberta Tree Nursery and Horticulture Centre Annual Report.

ALBERTA SPECIAL CROPS AND HORTICULTURAL RESEARCH CENTER

Summary

The Alberta Special Crops and Horticultural Research Center (ASCHRC) is involved in province-wide extension and research activities relating to all areas of horticulture and irrigated speciality crops, in fulfilling its overall crop diversification mandate. Cooperative research projects are conducted in collaboration with personnel from Agriculture Canada, University of Alberta, other Plant Industry Division Branches and the Alberta Environmental Centre.

The extension activities of ASCHRC personnel support and complement extension services provided by the other Alberta Agriculture staff centered in regional and district offices. Contact with both commercial and amateur horticulture clients is assured by maintaining a close working relationship with the industry, input into advisory committee recommendations, and involvement with grower groups and associations. Staff regularly conduct, teach and participate in numerous short courses and seminars held throughout the province. To ensure rapid exchange of information between the producer and the researcher, staff host commodity oriented field days at ASCHRC and participate in similar field days held elsewhere. Membership and active involvement in commodity advisory groups, Agriculture Canada expert committees, and industry-based committees permit the dissemination of applied research information to all sectors of the horticulture and special crops industries.

BRANCH ACTIVITIES

The following reflects highlights of the Center's research and extension programs. Further details are available from the Center's Annual Report and the ASCHRC pamphlet series. (See publication sections for a listing of titles).

EXTENSION

All professional staff maintain both a research and extension responsibility. Extension activities can best be summarized as follows:

- direct contact with producers, typical of all programs but highlighted in the greenhouse program
- direct contact with industry fieldmen (potatoes and vegetable program)
- input to industry newsletters
- presentations at conferences, seminars and workshops
- conducting industry field days
- on-farm demonstrations
- publication of ASCHRC newsletters. The Center publishes "Fruit Facts" for the fruit industry, the "Processing Vegetable Growers Newsletter", and the "Crop Protection Newsletter".
- writing of extension publications such as the Vegetable and Potato Production Guide

CROP PROTECTION AND UTILIZATION SECTION

1. Plant Pathology Program

A survey was conducted on 11 commercial safflower fields for seedling blight. The disease was found in each field; up to 82% of plants in one field were blighted and severity ranged from 9.4 to 28.6 on a disease index scale of 0-100. Ten fungicides were evaluated for their control of seed decay and seedling blight of safflower. Most provided moderate to good control.

Control of powdery mildew on European seedless cucumbers is of significant concern to the greenhouse industry. Two rates of potassium silicate and different application intervals were evaluated. Silicon did not significantly reduce mildew incidence or severity, but did increase the weight and number of marketable fruit.

2. Food Processing and Quality Evaluation Program

Quality deterioration of saskatoon berries during frozen storage over 24 months was examined. Generally pH levels increased over the first six months of storage. Colors became darker and flavor volatiles were lost. Long term frozen storage is likely not an acceptable practice.

Assistance was provided to the Special Crops Program. The quality of essential oils extracted from several herbs was determined by gas chromatography.

3. Horticultural Entomology Program

Management of biological predators to control Western Flower Thrips in greenhouse vegetable crops continued as the major thrust of this program. The minute pirate bug, Orius tristicolor white, was introduced in commercial and research greenhouses to determine whether it would complement the predatory mite, Amblyseious cucumeris. Data from one pepper crop and five cucumber crops indicated that the two predators may be compatible and complementary.

Twenty-seven sites in southern Alberta were monitored for Dutch elm disease vectors, none were found.

4. Post-Harvest Physiology Program

Silver scurf, a storage disease of potatoes, continues to cause problems for processors in Alberta. The causal fungus Helminthosporium solani has developed resistance to the only registered post-harvest fungicide, Mertect. An extensive survey was conducted to determine the extent of this chemical resistance and to investigate alternate control recommendations. Funding was received from the Alberta Potato Research Committee.

An experimental fungicide (ANVIL) was tested for effectiveness in controlling fairy ring in turf. Results are not yet available.

5. Regional Crop Laboratory Program

One thousand, three hundred and sixty-one plant disease, insect and plant identification specimens were received this year. Two thousand, six hundred and thirty-six telephone enquiries were handled by the Center's Information Officer during the summer.

6. Weed Control Program

A herbigation trial was conducted to test the efficacy of several herbicides for late season nightshade control in drybeans. Dual and Eptam were evaluated; no crop injury was observed.

Funding was received from the Minor Use of Pesticides Program for testing the tolerance of monarda and spearmint to Poast and Edge. No noticeable injury was observed on either crop.

SPECIAL CROPS AND AGRONOMY SECTION

1. Special Crops Program

A foliar fertilization test was conducted to determine the effects of spraying different kinds and formulations of chemical fertilizers on the foliage of two drybean cultivars. None of the applications, either macro or micronutrients increased the yield of pinto drybeans.

The new red lentil "Rose" was comparable in yield with the cultivar "Eston". The most promising new lentils tested were the MCPA resistant lines.

2. Field Crops Program

The practice of double cropping spring and winter cereals for silage, hay or pasture was investigated. Double cropping for pasture use provides high yields throughout the season and compares favorably with winter cereals seeded alone. Seeding ratios are being investigated.

A number of new varieties of alfalfa are being tested. In the first year of harvest the variety "Elevation" out yielded the check variety "Beaver" by 5%.

3. Soil and Water Agronomy Program

A project funded by Farming for the Future, commenced in 1989, was designed to evaluate the tolerance of 27 species of ornamental trees and shrubs in five salinity zones.

Salinity levels were determined by use of the portable EM38 meter and for most species a significant correlation was obtained between the salinity level in the soil and the growth of trees.

HORTICULTURAL CROP PRODUCTION SECTION

1. Potato Program

Two seedlings from the Prairie Potato Breeding Program were named, selection A69868-2 is named "Amisk", selection W848 is named "Niska".

The Center's potato program was significantly set back when bacterial ring rot was discovered on the Center during the summer. The disease originated with seed received from Ontario and was confined to several rows, however for sanitation purposes most potatoes on the Center were destroyed. This loss included seed being multiplied for industry trials.

2. Vegetable Program

Plant population studies were conducted for brussels sprouts and zucchini. Nine population densities of brussels sprouts, ranging from 10.6 to 35.8 thousand plants per hectare indicated that the overall yield of the cultivar "Oliver", was most effectively increased by closer spacing of plants in the row. The zucchini cultivar "Super Select", was grown at three populations, 37, 57 and 111 thousand plants per hectare. Overall yield increased along with plant density.

Nine cultivars of baby carrots were grown on raised and flat beds. Higher yields of marketable roots were produced when grown on flat beds.

3. Fruit Crops Program

Sixteen cultivars and seven selections of Junebearing strawberries were compared for winter survival with a straw mulch cover and an unprotected control. Strawberries protected with straw mulch

produced higher yields than those without winter protection. The cultivars Glooscap, Kent and Bounty were the highest yielding.

Management studies with day neutral strawberries and the evaluation of primocane raspberry selections continued.

4. Ornamentals Program

A trial funded by Farming for the Future was initiated to study factors which affect cold resistance of two cultivars of container grown nursery stock, Potentilla fruticosa, Coronation Triumph, and Cornus sericia, Baileyi. Containerized seedlings were subjected to two acclimation regimes and then frozen in two different regimes. This work is ongoing.

5. Greenhouse Crops Program

Two growth regulators, Sumagic and Bonzi, were evaluated on petunias, carnations, and alyssum. High rates of both produced unmarketable plants because of reduced growth. Low rates of Bonzi may prove to be acceptable. Lower rates of Sumagic will require further testing.

Nine powdery mildew resistant greenhouse cucumber cultivars were evaluated. All varieties were inoculated and rated for susceptibility. No cultivar was totally resistant, however the standard cultivar "Corona" was the most severely infected and also produced the lowest yield.

ADMINISTRATION

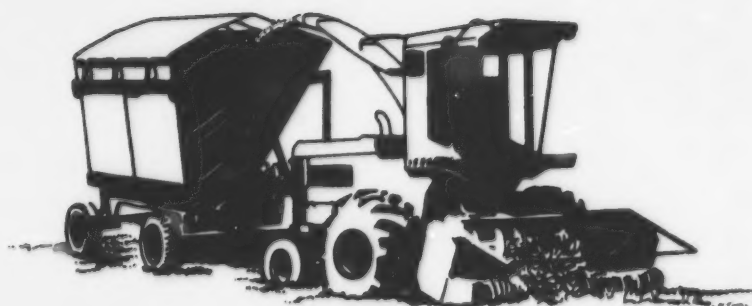
The Center hosted an annual field day in August. The field day attracted over 1,500 visitors. Several commodity oriented field days were held as well such as fruit crops and potatoes. The Center hosted

tours of the Southern Alberta Regional Planning Commission and the Faculty of Agriculture staff, University of Alberta.

Construction of the addition to Hargrave Building was completed and the building was officially opened by the Honorable Ernie Isley, Minister of Agriculture.

Development of the Bow Island Substation commenced with the installation of an irrigation main line and the moving of office trailers. A long range development plan is in progress.

REGIONAL CROP PRODUCTION REPORTS



REGIONAL REPORTS

Region I - Lethbridge

Blair Shaw, Regional Crop Production Specialist

Crop production for 1989 was not outstanding outside of the one million plus acres of irrigation. The grasshopper was the most significant pest, mainly in the Magrath, Cardston and Granum crescent.

The Russian Wheat Aphid (RWA) did not cause any great amount of problems. The wet conditions of a chinook, followed by a cold snap, seemed to all but eradicate the RWA population. The Brown Wheat Mite was of little consequence.

Wind erosion continued to be a concern over the region. Farmers have taken preventative and emergency measures as a result of a department wide soil conservation initiative. The reduction in soil erosion can be directly attributed to this initiative and the Alberta Wheat Pool "Conservation 2000" program, which was first launched in the southern region.

The control of weeds in the region began with an early spring Weed Inspector's Workshop which was staffed by Regional, Headquarter, ADA staff and CDA researchers. This meeting serviced the local municipal districts and counties as well as towns and cities.

Contact with the members of the Plant Research Management Association has fostered cooperation between Alberta and Montana in the areas of weed and exotic plant management. This cooperation has also included Waterton and Glacier (U.S.) National Park.

Knapweed occurred only in a few isolated patches which were intensively pursued to effect eradication. The use of sheep as a biological control method on leafy spurge continued. The bio-control (spearheaded by the

Environment Lab at Vegreville) with insects continued and was well accepted by the public.

Scentless chamomile and narrow-leaf hawk's-beard were a problem in small patches in the region.

Purple loose strife was of concern where its invasion into wet land may ruin waterfowl habits.

The movement of hay from Montana and British Columbia continued to be monitored to prevent the spread of weeds.

The Southern Region Irrigated Crop Protection Workshop was held at the Agriculture Centre in July. This course was designed to upgrade agri-business and extension staff who then will pass their newfound skills into the broader range of agriculture.

The cooperative radio program with the seed industry (SeCan) was a great success and is another example of agri-business's willingness to work with Field Services staff in the southern region.

Cooperative programs and working groups have continued to emerge in the areas of aquatic weeds, Dutch elm disease, soil conservation, hay processing, winter wheat and seed treatment.

The broad interest and market opportunities in oats resulted in plots of special quality oats in five agriculturists' districts.

Waxy barley is an alternative crop which can be grown but the market opportunities are not clear. The opportunities for organic agriculture continued to expand with increases in the number of producers and quantity of production.

The Pincher Creek Cooperative Seed Plant was opened.

Region II - Airdrie

Larry Welsh, Regional Crop Production Specialist

The drought that first hit the region in 1984 extended again into the 1989 crop year resulting in the production of below average yields.

The spring began with much optimism, farmers felt the dry years had finally come to an end. Seed bed moisture was good and both germination and emergence were favorable. The good growing conditions extended well into June. However, some crops received a severe setback with heavy frosts in late May while the northeastern portion of the region experienced some rather bad hail storms in June.

Drought settled in July and the eastern two-thirds of the region suffered severe drought stress by month end. Crops continued to suffer badly until mid-August when rain finally came. By then yields were severely reduced and crops did not respond. The rain was too late to help crops and it also created a further problem of harvest delay. Crop grades and yields continued to deteriorate with each passing day of the wet weather. A quick summary would be "1989 goes into the record books as a year of poorly timed rainfall."

Harvesting eventually started about mid-September and continued without interruption well into October. This was a period of warm, dry weather that was much appreciated after the many crop production problems experienced earlier.

Cereal crop yields and grades were generally reduced, but canola came through the adversity much better with about 85% of the crop grading Number 1.

Hay crops were much better in 1989 compared to the previous year as the early spring moisture got them off to a strong start. Reasonably good yields provided adequate feed supplies throughout the winter.

Specialty crop acreage showed little change from the previous year. There was only a slight increase in mustard production.

Crop pests were confined to Bertha armyworms on canola, approximately 50,000 acres were sprayed in the region. Some beet webworms were also present, but were generally confined to weedy fields that required little attention. The Russian Wheat Aphid that threatened 1989 crops, fortunately did not come to pass.

Crop diseases were minimal because of the dry growing season. However, virulent blackleg of canola appeared for the first time in the region on a farm in the Craigmyle district. It has since caused much concern in that particular area.

Soil conservation received a tremendous thrust in 1989 with the announcement of the Canada/Alberta Soil Conservation Initiative (CASCI). All the Agricultural Service Boards in the region took advantage of this program and 1990 should see great strides made in soil conservation initiatives. The Alberta Conservation Tillage Society (ACTS) were very active in the region; regional and district staff again gave strong support to this producer group. A major reduced tillage demonstration, which will be ongoing for five years, started in the region at four locations.

Support continued to the region's twelve seed cleaning plants and the majority of them reported a successful year. Cleaning volume of the 12 plants totalled 4,294,332 bushels as of June 30, 1989 (end of the cleaning year). This volume was down somewhat from the previous year. Only one seed plant (Delia) took advantage of the upgrading grant program sponsored by Alberta Agriculture. The Three Hills plant continued to pursue their rebuilding program and hope to start construction of a new replacement plant in late 1990.

With the approach of the new spring season, soil moisture is considered generally poor throughout much of the region. Timely rains will again be essential for successful crop production in 1990.

Region III - Red Deer

Wayne Jackson, Regional Crop Production Specialist

Price outlook for 1989 was improved over the previous three years but early growing conditions were less than ideal. Surface moisture was adequate and sub-surface moisture was very low. Soil temperatures remained cool well past mid-May, early seeded crops were slow to emerge and stands were very uneven.

The eastern third of the region had an extremely dry growing season, most producers salvaged what they could for feed. The middle third of the region had reasonable moisture and was rewarded with fairly good crops. The western third of the region had a summer of scattered showers. Rainfall amounts fluctuated wildly within a few miles. Quality of hay and cereals was reduced due to the untimely rains.

Field Crops

Forage growth was very slow in spring due to cool temperatures. Scattered showers during the summer prevented much top quality forage from being harvested, only those producers who had a late second cut got top quality. Feed supplies were adequate for most of the region with only the eastern 1/3 of the region being forced to import feed supply. Several producers started to look at hay as a cash crop for the export or domestic market.

Of the cereals, wheat was the best choice financially. Yields did well and prices were reasonable. Canola yields were disappointing due to thin stands, diseases and pests. Barley yields were fair but quality was poor. Many fields had sprouted swaths and bushel weights were down. Oat yields, prices and market opportunities were fairly good leaving oat producers with reasonable returns.

Prices were stagnant so deliveries were very sporadic in the fall.

Field pea acreage remained constant as a "core" of producers have realized the benefit of field peas and are making them a permanent part of their rotations.

Seed cleaning plants had a good year as dockage cleaning increased. Six of the thirteen plants in the region cleaned record volumes.

Soils and Conservation

Soil erosion was reduced in 1989, compared to previous years, due to increased snow cover during the winter. Producers are also switching more to systems of reduced tillage and increased crop residues on the soil surface.

Service boards are responding to the opportunities provided by CARTT and CASCI for soil conservation awareness and demonstrations.

As more air seeders are being used, farmers are switching away from anhydrous ammonia and moving towards granular types so they can deep band and cultivate in one operation.

Horticulture

Looking back ten years ago, greenhouses were being built as hobby projects. Now, however, they are part of several farming enterprises that provide a significant portion of the family income. Cut flowers for florist shops and market gardens are growing in demand.

There was a considerable amount of winter kill on native and established shelterbelts as a result of the 1989-90 winter. Many plantings were under stress from the drought conditions and didn't survive.

Pest Control

Insects and diseases were more abundant this year than in the past several years. Along the Saskatchewan border, grasshoppers were a real

concern and some spraying was done. However, many crops were not worth salvaging so hoppers were left to forage unchecked in these fields.

Beet webworm and Bertha armyworms became a problem in several counties in August and about 12,000 acres of canola were sprayed.

Leaf diseases in cereals - especially barley - were a problem this year. Leaf stripe and scald could be found as early as the four and five leave stage and, although the crops appeared to recover, yields were not up to expectations.

Virulent blackleg in canola continued to spread, although the severity was the same as in previous years. Farmers in the area of infection are becoming more aware of the disease and are doing better rotations for control.

Alternaria blackspot in canola was also a major problem with a few fields yielding only 5-7 bushels per acre.

Weed Control

Perennial weeds such as quackgrass, toadflax, scentless chamomile and Canada Thistle continue to be a problem. With more continuous cropping and less tillage, perennial weed infestations are spreading.

Three confirmed sites have been identified in Region III of harbouring chickweed that is resistant to sulfonylurea products. Farmers are becoming aware of the importance of herbicide rotations and crop rotations.

Extension Activities

The number of extension courses held was as high as in previous years but attendance was down slightly. After three years of tight financial times, producers were more interested in pursuing social and recreational activities for the winter. Farmers attended only those courses that met a specific need.

Service boards are becoming more involved in extension through tours, visiting demonstrations plots and projects in their jurisdiction.

Economic Situation

Prices improved dramatically for cereal crops in 1989 compared to the previous two years. Although yields were not outstanding, net income on many farms improved, bringing a more optimistic outlook. Land prices started to improve by year end and more parcels were sold.

Region IV - Vermilion

Ellis Treffrey, Regional Crop Production Specialist

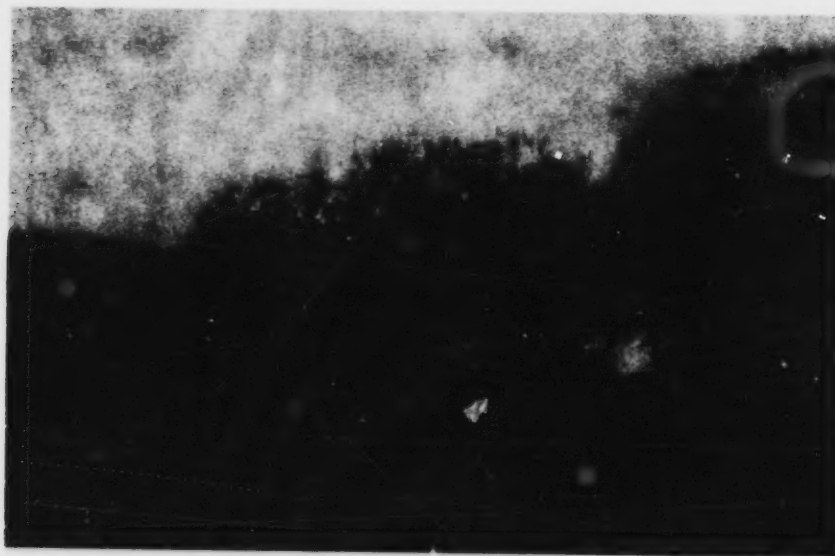
Bjorn Berg, Regional Forage Specialist

Grant Gillund, Regional Soil Specialist

The northeast region was very active in promoting good production practices in crops, forages and soil management.

EXTENSION ACTIVITIES

Demonstrations - A dramatic demonstration of the use of fire in the aspen rangelands was completed by regional staff in late April. Over 350 acres of dense, shrub-choked aspen were torched. This project has been the subject of a 20 minute video documentary. The use of this technology for range improvement was pioneered by University research on the Kinsella Ranch.



A conservation summerfallow project was planned and carried out by staff members in Region IV. This project utilized the narrow spaced, wide blade cultivator on eight sites in four districts in east central Alberta. Several agencies were involved including local government, Field Services, Engineering, Conservation and Development, Ducks

Unlimited and P.F.R.A. The project examined new machine technology and the criteria that must be considered when using conservation tillage on summerfallow. Soil moisture conservation was also evaluated, comparing the fall moisture on conventional fallow with that of conservation fallow.

Other demonstrations included several variety plots where more than 30 varieties of grasses and legumes were tested for yield. Trials were conducted on the use of hay preservatives aimed at improving both the quality of hay produced and the timing of hay making operations; and fertilizer demonstrations designed to test new formulations or new applicator techniques.



Consultations - The control and containment of blackleg is vital for the canola industry in Alberta and in particular, Region IV. With support from producers and the Alberta Canola Growers Commission, Region IV was the target of an intensive blackleg survey. At the same time a regional weed survey was also carried out. Crop rotations and the use of known means of disease containment and control will address blackleg

in canola until resistant varieties are found. Several local jurisdictions have instituted a follow-up program advising farmers of control measures after the disease has been diagnosed on their farms.

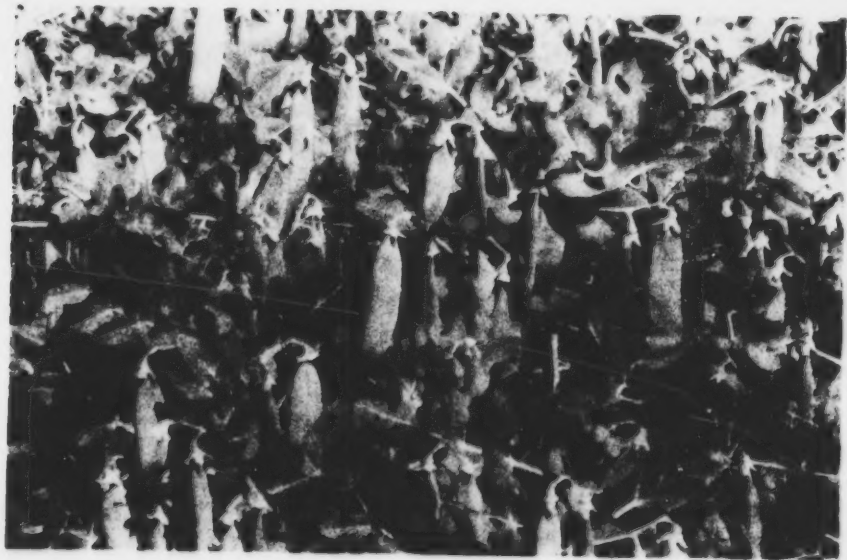
A disease survey of 35 alfalfa fields across the region detected a high incidence of crown rot infections. The survey was conducted jointly with the Alberta Environmental Centre at Vegreville and will be run again next year.

Producers in the region have been voicing a growing concern about soil compaction. In response to that concern a number of activities were initiated to determine the extent, degree and impact of soil compaction within the region. Ripping, liming and amended plots were monitored to evaluate remedial activities on compacted soils. Long-term studies have been started in conjunction with the Alberta Environmental Centre.

A number of other commodity and special interest groups maintain joint consulting projects as well. Ducks Unlimited are actively consulting with specialists for their Prairie Care program, which is attempting to increase water fowl production through grass seedings and pasture management.



The future of field peas with their good soil building capability and excellent livestock feeding potential are very important for the region - especially as an alternate crop and to swine producers. A major extension effort has been to acquaint producers with field peas and to establish benchmarks and criteria for production. To accomplish this, three pea variety demonstrations were established in the region in cooperation with the Alberta Pulse Growers Association. The resulting yield data and agronomics were used in individual and group discussions throughout the region on summer field days and during winter programs.



Soil conservation was a major emphasis in the region. Considerable support, guidance and cooperation occurred between regional and district agriculture staff, Agricultural Service Boards and producer groups within the region in the planning of the 1989-90 action plans. This cooperative involvement will continue to grow in 1990.

Alberta Hail and Crop Insurance have adopted some of the new remote sensing technology which this region has been promoting for the detection of drought and crop stress.

Meetings/Courses/Tours - Numerous speaking engagements across the region delivered up-to-date information to producers. Forage topics ranged from producing grass seed, through pasture management to hay and silage production techniques, and hay marketing issues. A fall cattlemans' tour discussed the results of producers' own experiences with rotational grazing and methods of extending the grazing season.



Public support and interest is high for the regional cereal and oilseed variety testing program. With the increase in variety numbers, farmers are showing a keen interest in new varieties and how they adapt to local conditions. During the summer months, talks on the cereal and oilseed varieties being demonstrated in the plot sites were given during the Soil Conservation, Lamont Agricultural Service Board Tour and at the Vegreville Environmental Centre field days.

Soil fertility management was emphasized from staff and industry promotions within the region, with respect to cost and benefits. Micro nutrients (mainly copper) were part of the standard promotions of many of the fertilizer dealers. Follow-up work and plots were established by regional and district staff.

Three major in-service training courses for regional staff were held. A herbicide training session involving 11 chemical company representatives, discussed new and changed registrations, and problems and concerns prior to the spray season. A similar course on cereal and oilseed varieties was held to discuss regional and provincial test plot results and variety characteristics pertinent to the region. The third session involved the regional weed inspectors in-service training, held in conjunction with the Vegreville Environmental Centre and provincial weed specialists. Topics discussed included the Weed Act, weed identification and the duties of the weed inspector in relation to the agricultural programs administered in the district.

All these courses upgraded staff at the various levels of extension in the region and involved industry, other government departments and provincial specialists.

FACILITATION/COORDINATION

Plant Industry Inspections - The 15 seed cleaning plants in the region met the criteria and standards as outlined in the Weed Act. The inspection program as carried out in cooperation with local government and the Association of Alberta Coop Seed Cleaning Plants. Notable was

the yearly improvement of various facilities made possible through the three-way upgrading program. One new replacement plant was built to serve Willingdon and surrounding area.

Industry Liaison - Close contact and joint extension meetings were held with the regional representatives of chemical, seed, fertilizer and processing industries. Quite often these companies supply their products for trials and demonstrations with little or no charge. For example, most of the forage seed in the variety adaptation trials at Smoky Lake and Vermilion was donated.

The "Grow With Canola" Program ended in 1989 and will be replaced with "Blue Print For the Nineties". During the year the concept of the three Alberta Canola Productivity Centres was formulated by the Canola Council of Canada. One of the centres was proposed for the Mundare area. This Centre will host several applied research projects which will be undertaken on site. The Centre can also offer a location for summer extension activities involving provincial and local personnel.

Region V - Barrhead

Bill Chapman, Regional Crop Production Specialist
Ken Lopetinsky, Regional Forage Specialist

Average grain prices and lower than average yields (75% of normal) depressed farm incomes. Rainfall levels ranging from 75% to 200% of normal caused high disease levels during the growing season and then delayed harvest an additional 12 to 18 days. The harvest delay caused secondary yields losses through sprouting and weathering on both standing and swathed crops. Total growing season precipitation ranged from 14" (35 cm) in the central and east side of the region to a high over 36" in the west Sangudo to Mayerthorpe area south to Drayton Valley. A 70,000 acre hailstorm also caused serious damage in July.

Lower soil temperatures and a May snow storm caused spring soil moisture levels to be average. These conditions resulted in pre-emergent herbicide problems with Avadex on all cereals and reduced plant stands. Canola suffered as early frosts and an increased level of seedling blight also reduced plant stands. Wet windy weather in June shortened the herbicide application season and started the plague of leaf diseases on barley crops. Two row barley seeded on barley stubble had a higher than normal level of scald by the 2 to 3 leaf stage. As a result of these conditions, the first true leaf senesced off earlier than normal causing an increase in the number of crop tolerance complaints on post-emergent herbicides.

Significant disease levels of scald, net blotch and root rot in barley reduced grades to 99% feed. Poor quality samples were blended off at elevator systems as Number One feed standards were at the minimum of 45 to 46 lbs/bushel. The number of malt barley carlots suffered as approximately 20 carlots were accepted compared to an all time high of 220 cars in 1988-89. This had a significant impact on farm income and seed cleaning plant volumes in 1990. Problems of small localized dry areas, such as Westlock, Clyde and Fawcett, as well as, an area north of Athabasca suffered yield losses in August.

Disease problems in canola were significantly higher than normal. Field levels of sclerotinia ranged from 30 to 40% of plants diseased resulting in a 20% yield loss. Alternaria black spot also reduced yields an additional 10 to 40% in problem areas. Yield averages were 18 to 20 bu/acre. The only good yields, 40-46 bu/acre in Gibbons-Fort Saskatchewan area were on fields that were ground or aerially sprayed with fungicides. The 70,000 acre hailstorm from Sangudo-Morinville to Waskatneau also contributed to high losses from alternaria.

The most consistent crop for returns - 40,000 per acre (based on cost return studies) and quality was wheat. Most growers averaged 50 to 60 bu/acre of #3 CW H.R.S. Farmers growing prairie spring wheat varieties suffered lower yields due to increased diseases: root rot, glume blotch and Fusarium spp.

The developments of performance, human consumption and future value added oat products has created excellent opportunities for farmers in the region. Westglen Mills has a 7.4 million dollar plant at Manola; Alberta Oats has a 1.4 million dollar processing plant at Daugh and the 8 million dollar pulse-oat upgrading at the Morinville Seed Cleaning Plant will all aid in meeting the demands of oat production in the region. There was a major price decline of oats at the start of 1990 due to excessive amounts of variable quality feed oats.

The extension programs followed the Strategic Management Plan set out by the Cereal and Oilseed Planning Group. Meetings and programs were individualized for each district. Topics included crop diseases, rotations, varieties, integrated economic crop production and soil conservation. Programs were designed to maximize crop yields accordingly and meeting attendance was back to normal.

Regional staff set up a Fertilizer Dealer Update on copper in cooperation with the Soils Branch. Joint meetings were held with the Alberta Canola Commission as well as the Western Barley Growers Association. Local variety demonstration plots were done in cooperation with the Canola Council.

Crop clubs continued to carry out demonstration projects on production. Clubs involved were the Pembina in Westlock, Pro Gro Canola in Fort Saskatchewan, and the Leduc Crops Club. A new production marketing club has started in the Fort Saskatchewan area with Superior Agro Ltd. Agricultural Service Boards continued regular programs on weed control and demonstration plots. Increased activity under the CASCI program brought a limited amount of funding into the region.

Seed cleaning volumes in 1989-90 were lower than 1988-89 at 4.5 to 4.6 million bushels. Total pedigreed seed cleaned was 641,037 bus, up substantially by 60% from the 1988 crop. Plant upgrades at Morinville, Radway and Gibbons were completed and the new plant at Boyle is under construction.

A lot of time was spent coordinating applied research projects through the On Farm Demonstration Program. Projects included a Sclerotinia Monitoring and Fungicide Trial with Pro Gro Canola Club, Barley Varieties, Copper Fertilizer and Soil Temperature Monitoring with North West Peat Soils Association.

Forages and Special Crops

The variability of rainfall throughout the year and throughout the region affected the success of all forage and special crops. Quality deterioration was evident in most second cut hay, forage seed and pulse crops. Extension activities throughout the year closely followed a strategic plan in both the forage and special crops areas. A total of 38 extension activities and 14 On-Farm-Demonstration projects resulted in a high profile for these areas in the Northwest region.

Forages - Continued the region's high profile forage extension program, including excellent pasture systems demonstrations at the West Central (WCFA) and Pembina Forage Associations (PFA). The PFA On-Farm-Demonstrations on Pasture Cost Study completed its first year

with close to 1,700 cow/calf units studied on over 20 pasture systems. This cost of AUM on pasture is very important aspect of pasture management and it has been continued in 1990.

The forage seed industry again declined due to low prices and a very poor seed set of most crops combined with weather deterioration and a poor harvest.

The dehy industry (3 plants) had a very successful year although weather did affect second cut quality and cost of harvesting. Both the Legal and Barrhead plants commenced a mini-cube operation which led to a demand for high quality alfalfa hay throughout the fall. There is still a surplus of feed supplies in the area, although the quality is average at best.

Due to the extremely wet weather in the west half of the region and heavy Christmas rains causing icing on hay and pasture fields, a present concern still exists that winter injury may occur in some fields. Samples to date suggest that this injury will not be as great as was first anticipated.

Special Crops - Field pea production continues to be the major special crop in the region (35-40,000 acres). There was a slight increase in the 1989 acreage of other crops, primarily faba beans and canary seed. Due to the weather, field pea yields were reduced to approximately 50% of mid summer potential. Harvested yields averaged 30-35 bu/acre with a range of near zero to over 50 bu/acre reported. Some field pea production did produce a high quality human consumption pea due to advanced harvest management systems.

The Northern branch of the Alberta Pulse Growers Association now called Zone 3 of the Alberta Pulse Commission continued an ambitious plot and demonstration program. Successful summer tour day and pea harvest field day highlighted this program.

Highlights:

- Zone 3 of the Alberta Pulse Commission commenced a 3 year CASC program for 1990 which includes a producer conservation survey, three demonstration sites on crop rotations including pulse plow down and pulses for grain harvest.
- After years of input by many team players across the department, regional co-op testing for both perennial forages and for field peas has become a reality. One perennial forage site and one field pea site, which includes the European pea screening trial, have been selected and will be seeded this spring. Although more than one site is required in the future for the region, this development is a positive step and well appreciated by the respective industries.
- A decrease in forage association funding to both West Central and Pembina Associations will result in a decrease of activities, impact, and overall effectiveness of these very important groups within the next 2 to 3 years.

Region VI, Peace River

Mike Rudakewich, Regional Crop Production Specialist

Several factors dominated the 1989 crop year. There was sustained interest and acreage in hard red spring wheat production. The region reached an all time high for wheat at 1,127,000 acres, a 32% increase from 1988. The wheat acreage increase was mainly at the expense of canola, barley and fallow.

The growing season was characterized by extremes of snow and rain in mid-May followed by a short interval of drought in June and then high rainfall from late July to November.

Some of the major consequences caused by the weather patterns were a reduction in crop yields by 25-30% from the input targets; no malting barley selections; reduction in seed quality of all crops; and 550,000 acres of unharvested crops mainly in the southwest portion of the Peace.

Forage seed crop yields were fair to good with some fields remaining unharvested because of wet ground conditions.

Canola crops were affected by unusually high levels of sclerotinia which in some cases reduced yields by 50%.

Acreages of all special crops declined because of some resurgence in the prices of cereals and oilseeds.

Extension Activities

Crop Production - In contrast to prior years the extension activities in 1989-90 were planned by a committee which included four chosen producers from the region. Subsequently, the emphasis of the winter meetings were in response to the direction of the planning group.

Major winter activities were:

- Canola production with emphasis on varieties and disease problems.
- Wheat production highlighting agronomics, varieties and grade improvement.
- One day oat production seminar and workshop conducted jointly with the Alberta Oat Producer's Association.
- Forage seed production and marketing - though the market is on the downside there is interest among producers. Various groups interests have expressed the desire to have some organized approach (ie. organization) to direct research and marketing efforts.
- Weed Control - The planning group has strongly endorsed the need for an extended Herbicide and Weed Control Update for producers. Two were held, each two days in length, and all participants were highly receptive to all the information provided.

A new area of emphasis in perennial weed control was introduced with the combination of legume plowdown with fall rosette spraying of Canada thistle. A considerable amount of additional effort will be needed in these areas to bring this to a general practice level.

Seed Cleaning Plants

Municipal seed plant facilities and services continue to improve, but the competition from private plants is on the increase. At the present time there are as many private seed plants in operation as there are municipal.

INVENTORY OF RESEARCH PROJECTS



WEED RESEARCH

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Tansy Control - in non-cropland - in a grass hayfield - on roadside	Fallis	D. Maurice	Crop Protection Branch	Stony Plain and Athabasca sites - on-going projects ECW Research Report 1987-1989	0.002 0.002 0.002	0.01 0.01 0.01
Scentless Chamomile Control		D. Cole	Crop Protection Branch	ECW Research Report 1988-1989		
- in established alfalfa	Leduc			On-going project	0.005	0.02
Toadflax Control		D. Cole	Crop Protection Branch	ECW Research Report 1988-1989	0.005	0.01
- in established alfalfa	Stettler			On-going project	0.005	0.02
- in established alfalfa	Stettler					
White Cockle Control		D. Cole	Crop Protection Branch	ECW Research Report 1988	0.005	0.02
- in a mixed forage stand				On-going project		
- in established alfalfa	Nisku					
Seedling grass tolerance - to herbicides	Edmonton	D. Cole L. Darwent	Crop Protection Branch Agriculture Can. Beaver Lodge	On-going project ECW Research Report 1988-1989	0.01	0.03
Seedling legume tolerance - to herbicides	Edmonton	D. Cole L. Darwent	Crop Protection Branch Agriculture Can. Beaver Lodge	On-going project ECW Research Report 1988-1989	0.01	0.03

WEED RESEARCH (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
0x-eye Daisy Control - in established mixed forage - in established pasture	Buck Lake Edson	D. Maurice	Crop Protection Branch	On-going project ECW Research Report 1988-1989	0.005 0.005	0.02 0.02
Control of toadflax in crop and summerfallow	Mannville High River Gallihad	D. Maurice	Crop Protection Branch	On-going project ECW Research Report 1988-1989	0.005	0.02
Sulfonylurea - resistant chickweed control	Stony Plain	D. Maurice	Crop Protection Branch	Active Expert Committee on Weeds	0.10	0.02
Grassy weed control in field peas	Morinville Ft. Saskatchewan	D. Maurice	Crop Protection Branch	Active Expert Committee on Weeds	0.10	0.02
Broadleaved weed control in field peas	Morinville Ft. Saskatchewan	D. Maurice	Crop Protection Branch	Active Expert Committee on Weeds	0.10	0.02
Spreading dogbane control in summerfallow	Red Deer	D. Maurice	Crop Protection Branch	Active Expert Committee on Weeds	0.10	0.02
Pasture Sage Control - in native pasture	Irricana Three Hills	D. Maurice	Crop Protection Branch	On-going project ECW Research Report 1989	0.005 0.005	0.02 0.02

WEED RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Round-leaved mallow control - in wheat Biological and chemical	Carsland Rosebud	D. Maurice	Crop Protection Branch	Expert Committee on Weeds Research Report 1987-1989	.007	0.02
Scentless chamomile control - in cereals	Leduc Falher	D. Maurice	Crop Protection Branch	ECW Research Report 1988-1989	0.005 0.005 0.005	0.02 0.02 0.02
Established grass tolerance - to herbicides	Edmonton	D. Cole L. Darwent	Crop Protection Branch Agriculture Can. Beaver Lodge	ECW Research Report 1988-1989	0.005	0.02
Alfalfa-brome Establishment - with and without herbicides - with and without a cover crop	Edmonton	D. Cole J. Moyer	Crop Protection Branch Agriculture Canada Beaver Lodge	On-going project ECW Research Report 1989	0.02	0.04
Chemical-fallow	Daysland	D. Cole	Crop Protection Branch	ECW Research Report 1988-1989	0.01	0.02
Canada thistle control - in hayland	Rolly View	D. Cole C. Richardson	Crop Protection Branch	On-going project Public Lands	0.01	0.02

PATHOLOGY RESEARCH

Screening for smut resistance in barley	Olds	S. Slopek	Crop Protection Branch Co-operative project	Active	0.35	0.35
Screening for bunt resistance in winter wheat	Olds	S. Slopek	Crop Protection Branch Co-operative project	Active	0.05	0.05
Analysis of crop protection input interactions. Insecticides, fungicides, and pgr's.	Olds	S. Slopek	Crop Protection Branch Co-operative project (within and outside Alberta Agriculture)	Active	0.15	0.35
Barley leaf disease loss assessment. Varietal differences, timing of application, effect of fertilizer.	Olds	S. Slopek	Crop Protection Branch Co-operative project (within and outside Alberta Agriculture)	Active	0.20	0.15

ENTOMOLOGY RESEARCH

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Development of improved methods for forecasting grasshopper distribution and abundance.	Across Alberta	M. Dolinski D. Johnson	Crop Protection Agriculture Canada	Final report submitted to FFF.	0.1 0.2	
Correlation of Bertha armyworm larvae densities with pheromone trap results.	Pheromone trap sites throughout Alberta.	J. Jones	Crop Protection	Continuing	0.2	
Population biology of barley thrips.	Fairview, Olds.	M. Okuda	Crop Protection	Continuing	0.1	0.2
Varietal susceptibility to barley thrips.	Fairview, Olds.	M. Okuda	Crop Protection	Continuing	0.2	
Computer-assisted management of crop pests.	Olds	S. Slopek	Active Branch Co-operative project (within and outside Alberta Agriculture)	0.10	0.00	
Cultural management practices for control of plant bugs in fescue.	Fairview	M. Okuda	Crop Protection	Complete	0.2	

CEREAL AND OILSEEDS RESEARCH

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Development of new 6-row feed barley varieties for Alberta	Irrigation 1 site Area 1, 1 site Area 2, 1 site Area 3, 1 site Area 4, 4 sites Area 5, 2 sites Saskatchewan, 1 site	J. Helm	Field Crops	Ongoing Annual report Field Crops library Agriculture library	0.2	2.0
Development of new 2-row feed barley varieties for Alberta	Irrigation 1 site Area 1, 1 site Area 2, 1 site Area 3, 1 site Area 4, 4 sites Area 5, 2 sites Saskatchewan, 1 site	J. Helm	Field Crops	Ongoing Annual report Field Crops library Agriculture library	0.2	2.0
Development of high lysine and hullless barley varieties which have improved feeding value	Irrigation 1 site Area 1, 1 site Area 2, 1 site Area 3, 1 site Area 4, 4 sites Area 5, 2 sites Saskatchewan, 1 site	J. Helm	Field Crops	Ongoing Annual report Field Crops library Agriculture library	0.1	0.5
Barley germplasm creation and maintenance	Lacombe	J. Helm	Field Crops	Ongoing	0.1	0.9
The heritability of straw strength in Samson and other semi-dwarf barleys	Lacombe	J. Helm	Field Crops	Ongoing	0.1	0.1

CEREAL AND OILSEEDS RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMV	TMV
Cereal and oilseed regional variety trials on barley, wheat, oats, flax, & canola	Irrigation 4 sites Area 1, 4 sites Area 2, 3 sites Area 3, 4 sites Area 4, 6 sites Area 5, 7 sites Area 6, 5 sites	J. Helm D. Salmon B. Wolfe K. Briggs L. Dosdall S. Kibite H. Najda K. May	Field Crops Field Crops Ag. Canada U. of A. AEC Ag. Canada ASCHRC Ag. Canada	Ongoing, Reported Annual Report Cereal & Oilseeds Advisory Comm. Report in all research Libraries in Western Canada	0.1	1.2
Intensive management systems for barley, wheat and canola F.F.F.	Lacombe	J. Helm D. Penny	Field Crops Soils production	Report to FFF	0.1	0.7
Development of new spring triticale varieties	Irrigation 1 site Area 2, 1 site Area 3, 2 sites Area 4, 3 sites Saskatchewan 2 sites	D. Salmon	Field Crops	Ongoing Annual Report Field Crops & Ag. Dept. Libraries	0.2	1.9
Germplasm development and evaluation in Spring Triticale	Lacombe	D. Salmon	Field Crops	Ongoing	0.1	0.2
Evaluation of Winter Cereals for forage potential	Lacombe Brooks	D. Salmon J. Helm V. Baron	Field Crops Ag. Canada	Ongoing Annual Report FFF Report	0.1	0.1
Development of Improved varieties of winter wheat and triticale	Lacombe Brooks Lethbridge Olds Trochu Saskatchewan 3 sites	D. Salmon J. Helm	Field Crops	Ongoing Annual Report Field Crops & Ag. Dept. Libraries	0.25	1.7

CEREAL AND OILSEEDS RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Germplasm development and evaluation in winter wheat and triticale	Lacombe	D. Salmon	Field Crops	Ongoing	0.1	0.2
Seeding Rate, and date influence on Spring Triticale	Lacombe Provost Olds, Trochu Drumheller Stettler	P. Jedel D. Salmon	Field Crops	Ongoing Annual Report Field Crop & Ag. Dept. Libraries	0.1	0.1
Identification of lines of barley, triticale and winter wheat with improved levels of post harvest dormancy	Lacombe	D. Salmon J. Helm	Field Crops	Ongoing Published Crop Science Annual Report	0.1	0.2
Silage production of barley and triticale	Lacombe	P. Jedel J. Helm D. Salmon	Field Crops	Ongoing Annual Report Field Crops & Ag. Dept. Libraries	0.1	0.2
Screening barley for resistance to the smuts	Olds	S. Slopek J. Helm	Crop Prot. Field Crops	ongoing Annual Report	0.4	0.7
Screening barley and triticale for root rot resistance	Lacombe	J. Helm D. Salmon	Field Crops	Ongoing	0.1	0.4
Screening barley and triticale for foliar disease resistance	Lacombe Calmar Olds Trochu Winnipeg Vegreville	J. Helm D. Salmon F. Townley-Smith P. Kharbanda	Field Crops Ag. AEC C.	Ongoing	0.1	0.5

CEREAL AND OILSEEDS RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED		PMY	TMV
Barley cultivar response to some aspects of MEY management	Lacombe	P. Jedel J. Helm	Field Crops	Ongoing Annual Report	0.1	0.3	
Crop rotation in cereals	Lacombe	P. Jedel J. Helm D. Salmon	Field Crops	Ongoing Annual Report	0.2	0.2	
Yield reduction of barley due to lodging	Lacombe	P. Jedel J. Helm	Field Crops	Writing Annual Report	0.1	0.0	
Agronomic assessment of yield in xentral Alberta of barley cultivars	Lacombe Stettler Olds	P. Jedel J. Helm	Field Crops	Ongoing Annual Report	0.15	0.5	
Drought stress effects on barley and triticales	Lacombe	P. Jedel J. Helm D. Salmon	Field Crops	Ongoing Annual Report	0.25	0.5	
Influence of harvest date/ maturity on the yield and seed quality of spring triticales	Lacombe	P. Jedel D. Salmon	Field Crops	Ongoing Annual Report	0.1	0.1	
Forage potential of Wapiti triticales and Johnston barley underseeded to winter cereals for silage and grazing	Lacombe	P. Jedel D. Salmon	Field Crops	Ongoing Annual Report	0.1	0.1	
An evaluation of spring triticales mixtures for silage production	Lacombe	P. Jedel D. Salmon	Field Crops	Ongoing Annual Report	0.1	0.1	

CEREAL AND OILSEEDS RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PHY	TMV
An evaluation of mixtures of pulse crops and cereals for silage production	Lacombe	P. Jedel J. Helm D. Salmon	Field Crops	Ongoing Annual Report	0.1	0.1
Special crops agronomy	Lacombe Stettler Calmar Vermilion	P. Jedel J. Helm R. Park R. Gaudiel	Field Crops FFF	Final year Annual Report FFF Report	0.2	1.1
Studies on toxins produced by <u>Alternaria brassicae</u> , the causal organism of blackspot of rapeseed	Edmonton	P. Bains	ATN&HC	Ongoing	0.4	0.2

SOIL FERTILITY AND SOIL IMPROVEMENT RESEARCH

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PHY	TMV
Intensive crop management systems for wheat & barley under irrigated & dryland conditions	4 locations	D. Penney R.H. McKenzie E. Solberg J. Helm	Soils Branch Field Crops	Ongoing	1.0	3.00
The extent and location of Cu deficient soils	4 field experiments, 14 field scale trials	D. Penney E. Solberg L. Kryzanowski	Soils Branch Soils & Animal Nutrition Lab.	Ongoing Funded by Soils Branch, Esso and Cominco	0.30	2.00
Fertilizer and other input requirements for maximum economic yield	3 locations	E. Solberg D. Penney	Soils Branch	Ongoing	0.40	1.00
Spoke injection of fertilizer N in established minimum tillage systems	3 locations	N. Nyborg E. Solberg	U of A Soils Branch	Ongoing	0.10	0.25
Sulphur oxidation trial	Laboratory project	E. Solberg	Soils Branch Funded by Sulchem Ltd.	Ongoing	0.1	0.1
Technologies for post seeding application of fertilizer N	3 locations	E. Solberg D. Penney	Soils Branch	Ongoing	0.20	0.50
Spring and fall N spoke injection and broadcast methods of fertilizer N applications	2 locations	M. Nyborg E. Solberg	U of A Soils Branch	Ongoing	0.20	0.25

SOIL FERTILITY AND SOIL IMPROVEMENT RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
N dynamics of mature straw tillage systems	1 location	M. Nyborg E. Solberg D. Heaney	U of A Soils Branch Soils Animal Nutrition Lab	Ongoing	0.30	0.25
Acid phosphorus fertilizer	2 locations	E. Solberg	Soils Branch	Ongoing Funded by Sherritt-Gordon Ltd.	0.10	0.20
Efficiency of applied N use by brome-grass grown for pasture	2 locations	S. Mahli M. Nyborg E. Solberg	Ag. Canada U of A Soils Branch	Ongoing	0.20	0.40
Maximizing brome-grass pasture yield through optimum fertilizer N management	2 locations	S. Mahli M. Nyborg E. Solberg	Ag. Canada U of A Soils Branch	Ongoing	0.20	0.40
Effect of zero-till, N source and placement on the efficiency of N applied to barley	2 locations	S. Mahli M. Nyborg E. Solberg	Ag. Canada U of A Soils Branch	Ongoing	0.20	0.40
Evaluation of coated time release N materials	3 locations 2 lab experiments	M. Nyborg E. Solberg	U of A Soils Branch	Ongoing Funded by ESSO	0.20	0.60
Fertilizer requirements of dryland crops	16 major locations in Region I & II 3-5 crops per location	R.H. McKenzie H.H. Janzen	Soils Branch Ag. Canada	Ongoing FFF funded	0.30	3.0

SOIL FERTILITY AND SOIL IMPROVEMENT RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Soil phosphorus cycling and development of a laboratory test for soil phosphorus	Laboratory project	R.H. McKenzie J.F. Dormaar J.W.B. Stewart K. Perl	Soils Branch Ag. Canada U of Sask. Lethbridge Community College	Ongoing. Western Grains Research Foundation funded. Interim Report to FFF completed.	1.20	1.5
Nitrogen fertilizer timing and placement	4 locations	R.H. McKenzie	Soils Branch	Ongoing	0.1	0.4
Nitrogen mineralization	Lab. project plus 39 sites	S.S. Mahli D.J. Heaney	Ag. Canada Soil & Animal Nutrition Lab.	Ongoing	0.2	0.5
Assessment of deep plowing, ripping and the application of amendments for improving crop growth on Solonchic soils	46 locations	J. Lickacz	Soils Branch	Ongoing	0.50	0.50
Crop responses to liming and ripping of luvisolic soils	9 locations	J. Lickacz	Soils Branch	Ongoing	0.05	0.05
Nutrient requirements and deep plowing feasibility of organic soils	12 locations	R. Sherstabetoff	Soils Branch	Ongoing	0.70	0.70
Soil test methods for organic soils	3 locations	R. Sherstabetoff	Soils Branch	Ongoing	0.10	0.10

VEGETABLE AND POTATO RESEARCH

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Studies on stem canker and black scurf of potato caused by <u>Rhizoctonia solani</u>	Edmonton	P. Bains J. Letal	ATN&HC	Ongoing*	0.2	0.8
Tissue culture of seed potatoes	Edmonton	P. Bains J. Letal	ATN&HC	Ongoing	0.2	0.3
Control of rhizoctonia canker of potato	Edmonton	J. Letal P. Bains	ATN&HC	Ongoing	0.2	0.2
Enhanced nuclear seed potato tuber production for in-vitro propagated plants	Edmonton	J. Letal P. Bains	ATN&HC	Ongoing	0.1	0.1
Vegetable cultivar trials for cabbage, broccoli, cauliflower, carrots and sweet corn	Edmonton	B. Choban D. Bizon	ATN&HC	Complete** (1989)	0.1	0.8
Vegetable cultivar grower cooperative trial for cabbage and sweet corn	Peace River	B. Choban D. Bizon	ATN&HC	Complete** (1989)	0.01	0.03
Carrots - raised seed beds versus flat seed bed and spring versus fall seeding	Edmonton	B. Choban D. Bizon	ATN&HC	Complete**	0.05	0.3
Garlic - observations on various planting methods of spring versus fall seeding	Edmonton	B. Choban D. Bizon	ATN&HC	Complete**	0.05	0.2

VEGETABLE AND POTATO RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Spring versus fall seeding of onion, parsnips and spinach	Edmonton	B. Choban D. Bizon	ATN&HC	Complete**	0.05	0.3
Vegetable fertility trial for production of pickling cucumbers, broccoli and carrots	Edmonton	B. Choban D. Bizon	ATN&HC	Ongoing	0.1	0.9
Potato prairie regional trial	Edmonton	B. Choban D. Bizon	ATN&HC	Ongoing	0.01	0.2
Evaluation of gelrite and agargel in potato micropropagation	Edmonton	K. Pruski S. Pietucha V. May	ATN&HC	Ongoing	0.1	0.1
Effect of night-time calcium feeding on the yields of seedless cucumbers	Edmonton	M. Mirza M. Younus	ATN&HC	Ongoing	0.2	0.3
Effect of Humate (R) on the yield of tomatoes	Edmonton	M. Mirza M. Younus	ATN&HC	Ongoing	0.1	0.2
Effect of warm night and cooler day temperatures on the growth of bedding plants	Edmonton	M. Mirza M. Younus	ATN&HC	Ongoing	0.04	0.1
Evaluation of Humate (R) as a growing medium amendment	Edmonton	M. Mirza M. Younus	ATN&HC	Ongoing	0.06	0.1
Role of silicon in bedding plants nutrition	Edmonton	M. Mirza M. Younus	ATN&HC	Ongoing	0.01	0.1

VEGETABLE AND POTATO RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMY
NPK deficiencies in vegetable transplants and the effect on field performance	Edmonton	M. Mirza M. Younus B. Chohan D. Bizon	ATN&HC	Ongoing	0.02	0.2
Evaluation of <u>Bacillus</u> Macerans as an antagonist to <u>Pythium</u> in hydroponic system	Edmonton	K. Chang M. Younus M. Mirza	ATN&HC	Ongoing	0.3	0.2
Disease survey of <u>alstromeria</u> and other cut flower crop	Edmonton	K. Chang M. Mirza	ATN&HC	Ongoing	0.2	0.2
Pathogenicity of <u>Fusarium</u> species against <u>alstromeria</u>	Edmonton	K. Chang M. Mirza	ATN&HC	Ongoing	0.2	0.1

* Results are reported in the 1989 Annual Report of the Alberta Tree Nursery & Horticulture Centre.

** Trial results reported in the Alberta Tree Nursery and Horticulture Centre publication titled Vegetable Cultural and Cultivar Trials, Edmonton and Peace River, 1989.

ORNAMENTALS, TREES AND SHELTERBELT RESEARCH

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Nutrient study for woody plants	Edmonton	B. Casement	ATN&HC	Ongoing	0.02	0.03
Prairie region trial for woody ornamentals	Edmonton	B. Casement	CDA Morden	Ongoing	0.02	0.02
Regional woody plant test program	Grand Prairie	B. Rogerson B. Casement D. Berggren H. Heuver H. Mathers H. Kuperus		Annually to committee advisory meetings, commodity group meetings and Annual Report	0.05	0.10
Humalite trial in containers	Edmonton	B. Casement B. Breneman	ATN&HC	Complete	0.01	0.01
Effects of alfalfa pellets on growth of White spruce and Scots pine	Edmonton	B. Casement B. Breneman	ATN&HC	Complete	0.01	0.01
All American selections annual flower trial	Edmonton	B. Casement	AAS Committee	Continuing(to AAS Committee annually)	0.03	0.01
Demonstration shelterbelt	Regions III, IV and V	B. Casement A. Fieldmen	ATN&HC	Developing	0.01	
Shelterbelt evaluation	Altario Drumheller Vegreville St. Paul	B. Casement Farmers	ATN&HC	Ongoing	0.05	0.10
Micropropagation of Scots Pine	Edmonton	K. Pruski S. Pietucha Y. May	ATN&HC	Ongoing	0.1	0.1

ORNAMENTALS, TREES AND SHELTERBELT RESEARCH - (continued)

PROJECT TITLE	TRIAL LOCATION	RESEARCHERS	AGENCY	STATUS AND REPORTED	PMY	TMV
Interaction of cedar rust and saskatoons	Edmonton	K. Chang	ATN&HC	Ongoing	0.3	0.1
Production of saskatoons through tissue culture	Edmonton	K. Pruski S. Pietucha	ATN&HC	Ongoing (10,000 micro-propagated plants were produced)	0.5	0.4
Saskatoon rooting trials with Humate (R)	Edmonton	K. Pruski S. Pietucha Y. May M. Mirza	ATN&HC	Ongoing	0.1	0.2
Micropropagation of fruit crops (pincherries, sour cherries, raspberries)	Edmonton	K. Pruski S. Pietucha Y. May	ATN&HC	Ongoing	0.1	0.4
Changes in abscisic acid levels during the rooting period of saskatoons <u>in-vitro</u>	Edmonton	K. Pruski S. Pietucha M. Mirza L. Ozimek	ATN&HC U of A	Ongoing	0.1	0.2

ICAR SYSTEM
ESTB: 20923
ALBERTA SPECIAL CROPS AND HORTICULTURAL RESEARCH CENTER

ICAR ID	PROJECT TITLE
61004254	Potato Cultivar Improvement
61004255	Potato Production Research
61004263	Bulb Crop Cultivar Trial
61004265	Sweet Corn Cultivar Trials
61004266	Pea and Bean Cultural and Cultivar Trials
61004267	Cole Crop Cultural and Cultivar Trials
61004316	Weed Control in Pulses and Special Crops
61004319	Weed Control in Vegetable Crops
61004320	Weed Control in Nursery Crops and Shelterbelts
61004321	Weed Control in Potatoes
61006667	Herbicide Residues on Crop Rotation
61006694	Studies on Diseases of Greenhouse Crops and Interior Plants
61006784	Screening Potato cultivars for resistance to Early Blight, Rhizoctonia, Canker and Wilt Diseases
61006792	Field Bean Cultivar and Cultural Trials
61006793	New Crops Cultivar Cultural and Adaptation Trials
61006794	Herbs and Spices Cultural and Adaptability Trials
61006795	Corn and Sorghum Cultivar and Cultural Trials
61006800	Vine Crop Cultivar and Cultural Trials
61009474	Chemical Weed Control in Small and Native Fruit
61009475	Bush and Native Fruit Culture and Cultivar Improvement
61009476	Nursery Production of Woody Ornamentals
61009477	Annual and Perennial Flowers
61009478	Woody Ornamentals
61009485	Processing and Quality Evaluation of Potatoes
61009487	Processing and Quality Evaluation of Vegetables
61009488	Processing and Quality Evaluation of Fruit
61009489	Native Fruit Utilization
61009491	Culture of Greenhouse Vegetable Crops

ICAR ID	PROJECT TITLE
61009492	Evaluation of Hydroponic Systems for Growing Greenhouse Crops
61009493	Solanaceous Vegetable Cultural and Cultivar Trials
61009494	Vegetable Mulch and Tunnel Trials
61009495	Perennial Vegetable Culture and Cultivar Trials
61009496	Culture of Greenhouse Floriculture Crops
61009497	Root Crop Cultivar and Cultural Trials
84100555	Regional Woody Plant Hardiness Test Program
84100557	Evaluation of Chemical and Biological Agents to Control Greenhouse Pests
84100558	Small Fruit Culture and Cultivar Improvement
84100559	Perennial Forages
84100560	Cereal and Oilseed Regional Variety Trials
86000790	Fairy Ring Eradication
86000212	Water Management of Lentils
87000213	Water Management of Safflower
88000498	Epidemiology and Control of Dieback and Canker Diseases of Saskatoons
88000499	Annual Forages
88000500	Intensive Management of Irrigated Alfalfa Forage
89000156	Adaptability and Agronomic practices of Herbs, Spices and Essential Oil Crops
89000157	Salinity and Cold Tolerance of Ornamental Trees
89000158	Overwintering Container Stock
89000159	Commercial Adaptability - Essential Oils and Spice Crops

PUBLICATIONS



PUBLICATIONS

- Guide to Crop Protection in Alberta - Part I - Chemical, 1989. Crop Protection Branch.
- Backyard Pest Management. Crop Protection Branch.
- The Annual Research Report on Cereal Breeding at Lacombe. Field Crops Branch.
- New revised guidelines for "Municipal Co-operative Seed Cleaning Programs". Field Crops Branch.
- Alberta Horticultural Guide. Revised. Alberta Tree Nursery and Horticulture Centre.

FACT SHEETS

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| 622/6 | Russian Wheat Aphid. Crop Protection Branch. |
| 100/632 | Seed Treatment of Cereal, Oilseed and Pulse Crops. Crop Protection Branch. |
| 149/632-3 | Blackleg of Canola. Crop Protection Branch. |
| 532-2 | Copper Deficiency in Cereal Crops. Crop Protection Branch and Soils Branch. |
| 100/32 | Varieties of Cereal and Oilseed Crops for Alberta. Distribution via Farm Light and Power (80,000 copies) and by all extension offices. Field Crops Branch. |
| 120/32 | Varieties of Perennial Hay and Pasture Crops for Alberta. Field Crops Branch. |
| 140/32 | Varieties of Special Crops for Alberta. Field Crops Branch. |
| 130/14 | Range and Pasture Management when Dealing with Drought. Field Crops Branch. |
| 130/666-1 | Poisonous Plants on Range and Pasture. Field Crops Branch. |
| 541-1 | Alberta Fertilizer Guide. Updated. Soils Branch. |
| 532-2 | Copper Deficiency in Cereal Crops. New. Soils Branch. |
| 100/21-1 | Irrigated Crop Recommendations for Alberta 1989-1990. Updated. Soils Branch. |

FACT SHEETS - (continued)

- 318-8 Management of Solonchic Soils. Updated. Soils Branch.
- 250/15-1 Greenhouse Vegetable Production Guide, 1990-1991, for Commercial Growers. ATN&HC.
- 731-5 Hobby Greenhouses in Alberta. ATN&HC.
- 120/32 Varieties of Perennial Hay and Pasture Crops for Alberta. AFAC. Revised. ASCHRC.
- 127/15-4 Grass Seed Production Under Irrigation. ASCHRC.

ASCHRC PAMPHLET SERIES

- 89-1 The Golden Prairie Arboretum.
- 89-2 Ornamental Research Program.
- 89-3 Woody Ornamental Plant Trials.
- 89-8 Potato Cultural Trials.
- 89-12 Forever Green Pinetum.
- 89-13 Greenhouse Research Program, 1989.
- 89-14 Weed Control Trials, 1989.
- 89-19 User Documentation for the Fungicide and Fumigant Information Retrieval System (FFIRS), Version 3.1.
- 89-21 Preliminary results of adaptability, agronomic and weed control studies of herbs, spice and essential oil crops in Alberta, 1989.
- 90-1 Special Crops Cultivar Trials, 1989.
- 90-2 Annual Flower Trials, 1989.
- 90-4 Vegetable Cultural Trials, 1989.
- 90-5 Vegetable Cultivar Trials, 1989.
- 90-6 Fruit Crop Trials, 1989.
- 90-7 Report of the Food Processing and Quality Evaluation Program, 1989.
- 90-9 Field Crops Cultural and Cultivar Trials, 1990.
- 90-10 Plant Pathology Program Research Report.
- 90-18 Horticultural Entomology Program Research Report.

PERIODICALS/NEWSLETTERS/AUDIO-VISUAL

- Harrison, L.M. 1990. "Blackleg of Canola". The Peace Country Canola Update. Spring Issue, March.
- Harrison, L.M. 1990. "Blackleg of Canola". Northern Farmer Newsletter. March.
- Harrison, L.M. 1989. "Virulent Blackleg of Canola Survey." Northern Farmer Newsletter. December.
- North, P. Six issues - HEN (Horticulture Extension Notes).
- Vladicka, B. Four issues - Alberta Horticulturist
- Casement, B. Four issues - Alberta Nursery Notes
- Mirza, M. Ten issues - Alberta Greenhouse Notes
- Choban, B. and P. Ragan - Alberta Produce Notes
- Choban, B. and D. Bizon. Vegetable Cultural and Cultivar Trials: Edmonton and Peace River, 1989.
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- Casement, B. 1989. Transplanting Larger Trees - a Literature Review. Prairie Landscape Magazine, XII(2):5-8.
- Casement, B. 1989. Mulches, a Literature Review, Alberta Nursery Notes, 8(2):3-5.
- Casement, B. 1989. Overwatering Containerized Plants, Alberta Nursery Notes, 8(3):5-9.
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- Evans, I.R. 1989. Copper Deficiency Linked Diseases in Wheat and Barley - slide kit sets for distribution in Alberta.
- Evans, I.R. 1989. Diseases of Vegetables in Canada. Slide set assembly for "Western Committee on Plant Disease Control".
- Jones, J.W. 1989. Canola Insect Pest Situation for Alberta in 1989. Alberta Canola Grower. July:5.
- Evans, I.R. Diseases of Potatoes in Canola (new text - R. Howard, editor) - Diseases and Insect Pests of Vegetable Crops in Canada.

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- Slopek, S.W. and T.J. Labun. 1990. Incidence of eyespot in barley in Alberta, 1989. Canadian Disease Survey. Vol. 70, No. 1.
- Beasley, B., R. Gaudiel, B. Roth, D. Major. 1989. 1990 Hybrid Recommendation List. Alberta Corn Committee Publication.
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TECHNICAL MEMO

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| #12 | New Herbicide Registration - Refine |
| #13 | New Herbicide Registrations - Minor Use Registrations;
Other New Registrations |
| #14 | New Herbicide Registrations - Laser |

PAPERS/REPORTS

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